

Reference

408.3

FM 5-146

SS Oct 68

FM 5-146

Reference

DEPARTMENT OF THE ARMY FIELD MANUAL

**ENGINEER
TOPOGRAPHIC
UNITS**



**HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1963**

CHANGE }
No. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 21 September 1965

ENGINEER TOPOGRAPHIC UNITS

FM 5-146, 15 October 1963, is changed as follows:

Make the following pen and ink changes:

a. Wherever the term "third-echelon maintenance" appears substitute direct support maintenance.

b. In chapter 6, wherever either "intelligence section" or "operations section" appears, substitute operations and intelligence section; wherever the term "army in the field" appears, substitute field army.

c. In chapter 6 and in section IV, chapter 7, wherever the term "survey squads" appears, substitute survey sections.

d. In figure 16, change the block labeled "HQ HQ Co" to read HHC.

e. In paragraph 110, page 59, delete the last sentence.

f. In paragraph 150, page 68 delete (par. 110).

7.1. Mapping Programs (Added)

The activities scheduled in mapping programs vary during periods of war or peace, and are dictated by the immediate or anticipated requirements of the military forces.

a. During peacetime, the Department of Defense promotes mapping, charting, and photographic activities in foreign areas by negotiating reciprocal agreements with friendly foreign governments. Various parts of South America are mapped by a cooperative program. United States territories, such as Puerto Rico have been or are being mapped by various departments of the U.S. Government. Such activities exemplify the perspective of long-range planning. Elements of engineer topographic units may participate in these activities.

b. During the course of military liberations, military occupations, or periods of combat inactivity, theater commanders and their staffs should review the mapping, charting, and photographic situation.

Aggressive and appropriate action during these periods can accomplish much to improve the local coverage. Whatever activity is initiated during such periods is undertaken as an interim project and may embrace either original mapping or revision mapping.

c. Wartime mapping, charting, and photographing consist of filling the most critical needs in sequence of established priority. Although such activities are comprehensive in scope in regard to the theater of operations area, they represent a relatively small contribution to the long-range conception of world-wide, original mapping.

8. Development of Program

The mapping program in a theater of operations is developed by consideration of the following:

* * * * *

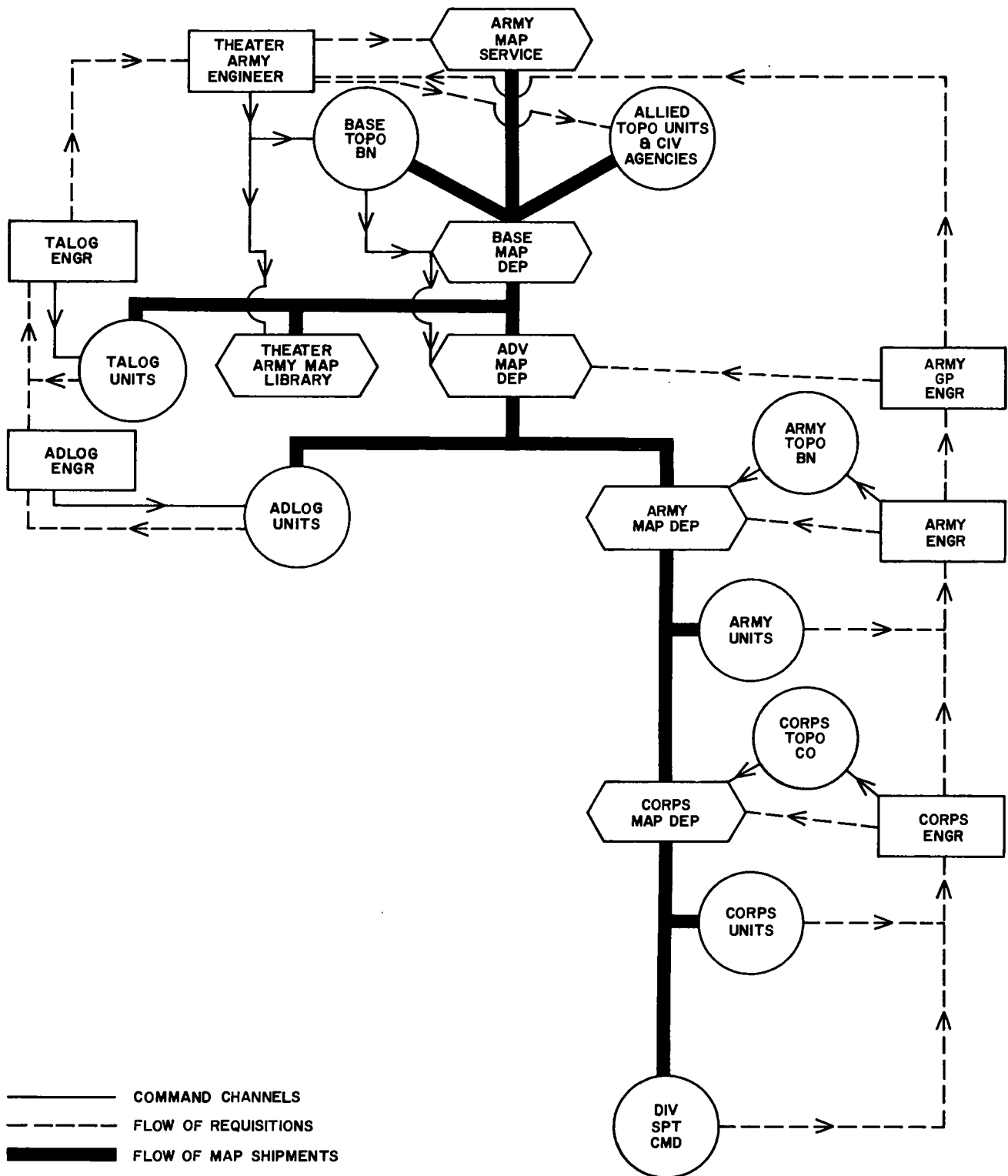
16. Map Planning, Supply, and Distribution Phase

* * * * *

c. The commander of *** provided as follows:

- (1) (Superseded) Base and advance map depots located in the communications zone and operated by the base topographic battalion. These depots furnish maps to army map depots and to COMMZ units.
- (2) (Superseded) Army map depots located in army service areas and operated by army topographic battalions. These depots furnish maps to corps map depots and to army units including the Field Army Support Command (FASCOM).
- (3) (Superseded) Corps map depots located in corps rear areas and operated by corps topographic companies. These depots furnish maps to corps troop units and to division support commands.

* * * * *



NOTE: A list of maps authorized for issue is normally published by corps or Army. Using this list as an authority, units may requisition maps directly from the depot serving them. Maps not on the list must be requisitioned through the appropriate command channels.

Figure 5. (Superseded) Flow chart of map distribution in a theater of operations.

21. Map Depot Operations

* * * *

c. Depot sites should * * * of the depot (fig. 6).
Approximate covered storage requirements for the various map depots is as follows.

- (1) (Added) A base map depot for each group of three field armies requires 45,000 square feet, increasing at the rate of 7,500 square feet per month of operations.
- (2) (Added) An advance map depot serving a field army requires 10,000 square feet.
- (3) (Added) An army map depot requires 8,000 square feet.
- (4) (Added) A corps map depot requires 3,500 square feet.

23. Topographic Supply

* * * *

c. (Added) Topographic units normally maintain a 30-day supply of map paper. The average daily consumption of map paper of the corps topographic company is 600 pounds; that of the army topographic battalion, two tons; and that of the base topographic battalion, five tons.

26. Water Supply

(Superseded)

An adequate supply of suitable water is an operational necessity for map reproduction operations. Map reproduction units must be provided with water that is free from visible and organic impurities such as algae. To meet this need, the reproduction platoon of the corps topographic company is authorized a 1½-ton water tank trailer. This trailer also provides water for the cartographic platoon. The map reproduction and distribution company of the army topographic battalion is authorized a 1½-ton water tank truck and a 1½-ton water tank trailer. Units of the base topographic battalion normally operate at fixed installations and obtain the necessary water from the installation water system.

31. Tactical Operations

* * * *

d. (Added) The use of topographic troops for combat may be very costly in terms of replacement of critical skills which might adversely affect subsequent operations. When an emergency situation, such as a breakthrough, requires combat employment of topographic units, they should be returned to normal duty at the earliest possible time.

32. Counterinsurgency

(Superseded)

Counterinsurgency includes all military, political, economic, psychological, and sociological activities directed against insurgent elements whose actions range from subversive political activity to armed efforts to overthrow a duly established government. Comprehensive, national counterinsurgency plans are required to integrate and coordinate the use of all military and nonmilitary means—including available outside assistance—to suppress and eliminate all forms of insurgency. Operations of U.S. Army engineer topographic elements in counterinsurgency may include the following major areas of activity:

a. Military civic action, which is the use of armed and paramilitary forces on projects useful to the local population in such fields as education, public works, agriculture, transportation, and similar fields contributing to economic and social development. These activities also serve to enhance the standing of the receiving state (RS) armed and paramilitary forces with the population.

b. Internal security operations which include supporting RS police and other essentially civilian organizations in their responsibilities to maintain law and order, and taking action to control human and material resources and deny insurgents access to those resources. These operations may also include assistance to USAID (United States Agency for International Development), USIA (United States Information Agency), and U.S. civilian intelligence programs in RS. Coordination of engineer position security with RS police and other internal security forces may be required.

c. For additional guidance in counterinsurgency operations, see FMs 31-16, 31-22, 31-22A, and 100-20.

33. Engineer Topographic Units in Counterinsurgency

* * * *

d. (Added) *Providing Printing Support.* When other printing facilities are not available, when such projects do not interfere with the primary mission of the unit, and when the necessary approval is obtained (TM 5-231), topographic units may print proclamations, identity cards, ration cards, directives, posters, and similar material in support of counterinsurgency operations.

e. (Added) *Advisory Assistance.* This may include furnishing specialized mobile training teams (SMTT) and training counterpart RS forces in topographic subjects.

36. Assignment

The normal assignment * * * to which normally assigned. **Topographic units in support of counterinsurgency operations may be assigned to MAAG's, subordinate unified commands, and contingency task forces.**

37. Employment

The extent of * * * by the theater. Within the broad scope of this regulation, the employment of the mapping capabilities of any topographic unit for other than mapping purposes is **generally** not authorized.

38. Capabilities

Some of the * * * operations are to—

* * * * *

g. (Superseded) Store and distribute maps and similar material required by corps, army, and TALOG units.

* * * * *

k. (Superseded) Operate seized civilian mapping facilities and lithographic printing plants (engineer topographic company, corps, excepted).

l. (Superseded) In counterinsurgency operations, assist counterpart topographic units and agencies in the fulfillment of their topographic missions.

39. Medical Support

(Superseded)

Engineer topographic units are dependent on higher echelons for arrangement of medical support. Normally, medical support is furnished by field army medical units as designated by the medical brigade commander or by a medical group commander coordinating with the corps surgeon. Should a topographic unit be reorganized for combat, it must furnish its own litter bearers.

40. Composition

a. (Superseded) The engineer topographic company, corps, consists of a company headquarters, a

map distribution section, a survey platoon, a cartographic platoon, and a reproduction platoon. Operations personnel and maintenance personnel for topographic equipment, vehicles, and other equipment are included in the company headquarters. When authorized by the Department of the Army, the survey platoon may be augmented by an additional survey section (fig. 9). In emergencies, the theater engineer may assign additional survey sections pending authorization by the Department of the Army.

* * * * *

43. Mission

(Superseded)

a. The mission of the corps topographic company is to provide topographic maps, overprinted maps, topographic intelligence, and artillery and topographic survey data in support of corps or independent task force operations.

b. Individuals of the company can engage in effective coordinated defense of the unit's area or installation.

43.1. Mobility

(Added)

The engineer topographic company, corps, is approximately 95 percent mobile with organic transportation. Additional transportation is normally required to move map stocks. The company is 100 percent air transportable in medium transport aircraft.

45. Operations Personnel

(Superseded)

The operations personnel for the company are included in company headquarters. These personnel are under the supervision of the executive officer, who is also the operations officer. The operations officer assists the company commander in planning the accomplishment of assigned missions, projects, and training.

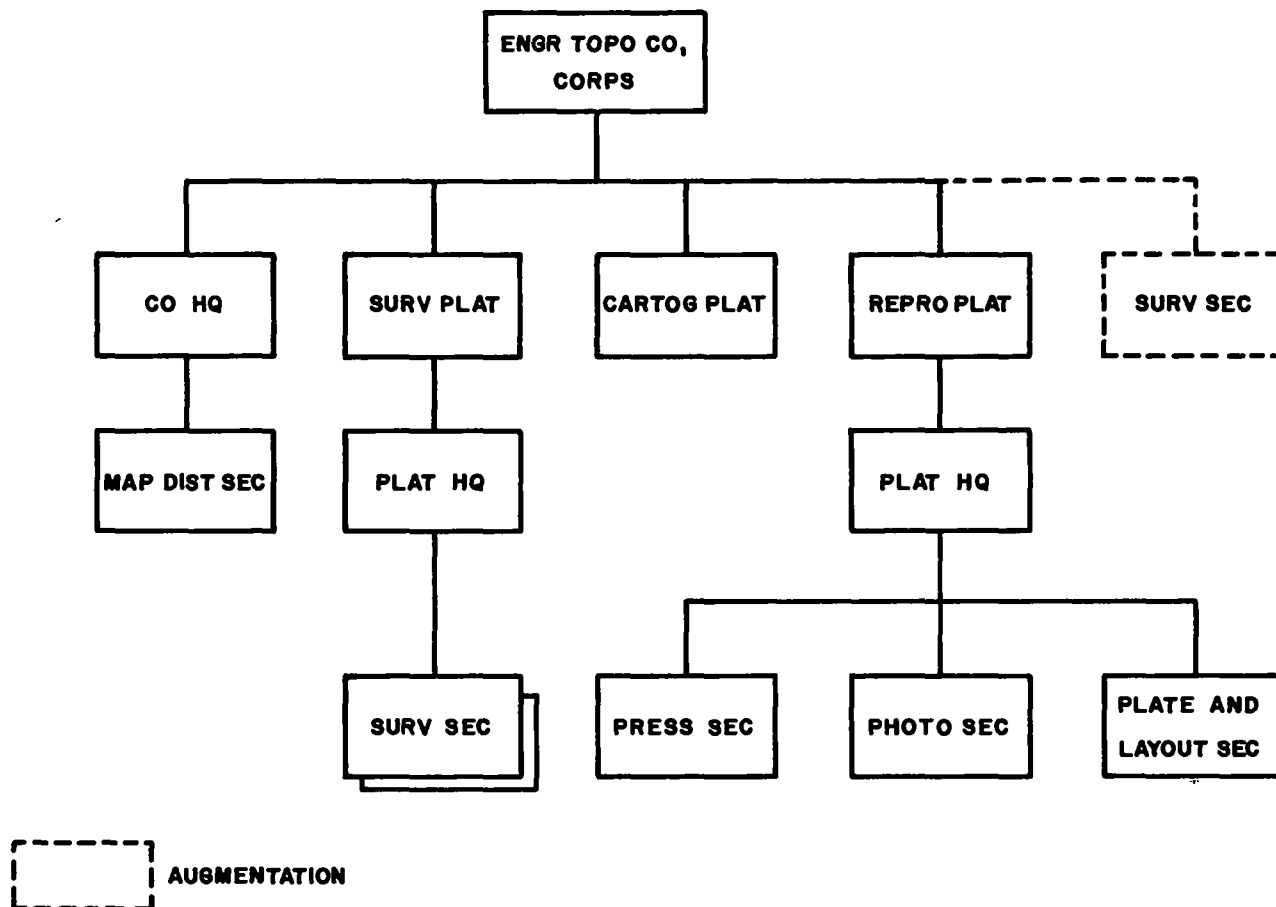


Figure 9. (Superseded) Engineer topographic company, corps.

47. Administrative Operations

* * * *

b. Corps signal units * * * to the platoons. Company headquarters has FM voice radios for operation in the company command net. It also has an AM receiver for use in a broadcast warning net.

* * * *

48. General

a. (Superseded) Technical operations of the company include all the necessary operations to produce maps and related matter for use by the corps in its area of responsibility. To accomplish this, the company, at full strength is capable of—

- (1) Performing topographic surveys of 2d or 3d order of accuracy for mapping and other functions. Surveys to extend position azimuth and elevation control forward from corps rear area into division rear area for all users of this control within the corps area.

- (2) Furnishing ground control within unit capabilities to corps artillery missile units and other artillery organizations on a first priority basis.
- (3) Performing survey cited in (1) and (2) above, using survey towers when augmented by attachment of personnel and towers.
- (4) Drafting special maps, overprints, and overlays for corps operations; laying controlled or uncontrolled mosaics from aerial photographs and making limited revision of existing maps at the rate of 10 to 20 map sheets per month; compilation and revision of military topographic and planimetric maps.
- (5) Reproducing in quantity—by offset, lithography—monochrome and multicolor maps, photomaps, overlays, overprints, and/or other topographic and engineer intelligence

material at the approximate rate of 600,000 impressions per month.

- (6) Receiving, storing, and making bulk distribution of maps, trig lists, and engineer survey control point information to corps units; collating and distributing engineer intelligence material as required.
- (7) Providing point locations through limited extension of ground control by photogrammetric means from a strip or strips of aerial photography to a distance of about 80 kilometers beyond existing ground control, within a period of approximately 36 hours, to include preparation and printing of a gridded area graphic.
- (8) Accomplishing limited field maintenance of topographic and reproduction equipment and special electronic devices.

b. The equipment of * * * and photomapping equipment.

- (1) (Superseded) In addition to its normal housekeeping equipment, company headquarters has tool sets provided for organizational maintenance.

* * * * *

49. Survey Platoon

(Superseded)

a. The survey platoon performs topographic surveys as required for topographic mapping and establishes ground control for missile support, surveillance devices, and conventional artillery. The platoon consists of a platoon headquarters and two survey sections. It may be augmented by an additional survey section when required (para 40).

b. Platoon headquarters consists of a warrant officer, who is a survey technician as well as platoon leader, a survey supervisor, a chief topographic computer, a topographic computer, a cartographic draftsman, a powerman, and a radio operator.

c. Each of the survey sections consists of a section chief, topographic surveyors, topographic computers, survey recorders, and rodmen-tapemen. These sections may be subdivided into small survey field parties—usually of three men each—for the accomplishment of specified survey missions. The survey platoon furnishes ground control to corps artillery and other organizations on a first priority basis when the situation is a changing one. During periods when the situation is static, the platoon improves its survey data and conducts engineer and topographic surveys as required. The survey

sections are authorized voice radio sets to maintain communication with platoon headquarters.

52. Aircraft Requirements

(Superseded)

Aircraft support is required for urgent surveys in support of artillery and missile fire control, for topographic mapping field survey operations, and for topographic survey reconnaissance operations. When required and when authorized, aircraft are provided by appropriate cellular teams of TOE 29-500.

54. Armament

(Superseded)

Armament of the company consists of individual weapons and rocket launchers.

55. Reorganization for Combat

(Superseded)

The corps topographic company reorganizes for combat to defend its bivouac and working area. The company should be divided into two echelons—a combat or forward echelon and a security or rear echelon. A typical reorganization is as follows:

a. The combat echelon consists of—

- (1) A company headquarters composed of the company commander, executive officer, first sergeant, operations sergeant, and communications personnel.
- (2) Two rifle platoons organized from the cartographic and reproduction platoons, and a third from the survey platoon if located near the company headquarters. Each platoon is organized into two rifle squads and a weapons squad (rocket launcher and automatic rifle with bipod). The two rocket launchers and two automatic rifles in company headquarters, with personnel to operate them, are assigned to the cartographic and reproduction platoons (one launcher and one rifle to each). This gives each of the three platoons approximately the same firepower.
- (3) The map distribution section, less the map distribution officer, is organized as a rifle squad. It serves as a small reserve at company headquarters, or is assigned to one of the platoons as required by the situation.
- (4) Radios (AN/GRC-125, dismounted from vehicles, and AN/PRC-25's) from the

survey sections, as available, are distributed equally among all the platoons to give them a communications capability.

b. The rear echelon, commanded by the map distribution officer, consists of those personnel of company headquarters not needed in the forward echelon. The rear echelon is responsible for fire-fighting, damage control, preparation and distribution of meals, and preparation for evacuation or destruction of equipment and materiel in the event the bivouac and working areas become untenable.

c. Corps provides telephone line from corps headquarters to the company command post. Company headquarters provides telephone line to the platoons.

d. Rations and water are supplied by the rear echelon to the combat echelon; hot meals are provided when the situation permits. Ammunition supply is controlled by the supply sergeant; transportation and loading personnel are furnished by the rear echelon.

e. The reorganization plan becomes effective upon receipt of an alert, usually from corps headquarters. On alert, all topographic work ceases. Equipment not already located in the rear echelon area (designated by the company commander) is evacuated to that area. Full field equipment is retained by all personnel. All other individual equipment is stored in the rear echelon area.

f. The company should rehearse its plan for reorganization for combat at frequent intervals.

g. Paragraphs 94 through 98 discuss the defen-

sive measures that should be employed against various types of attack.

56. Composition

* * * * *

b. (Superseded) The battalion as a whole is approximately 85 percent mobile. Its component companies have varying degrees of mobility.

60. Battalion Headquarters

Rescinded

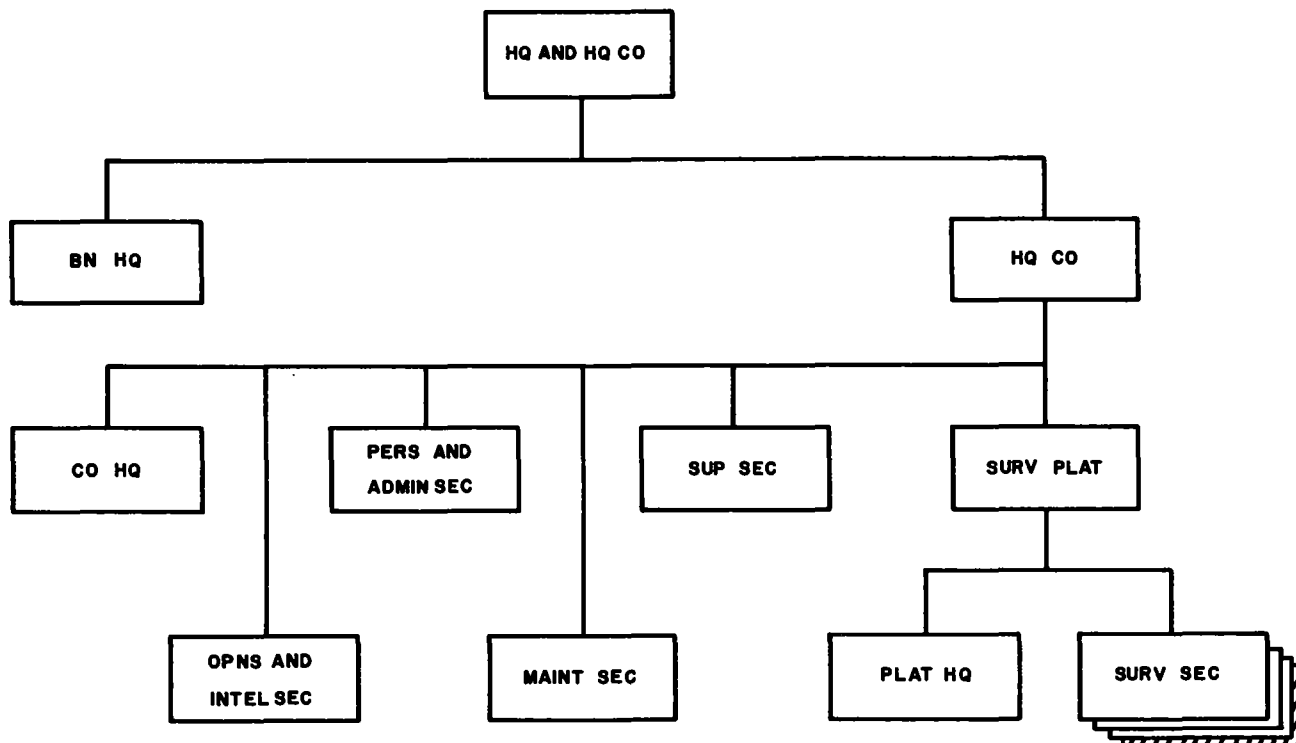
61. Headquarters and Headquarters Company

(Superseded)

a. *Battalion Headquarters.* Battalion headquarters provides the command and staff elements of the battalion and consists of the battalion commander, the executive officer, the adjutant (S1), the operations officer (S3), the supply officer (S4), the map reproduction officer, and the sergeant major. The operations officer performs additional duties as the intelligence officer (S2).

b. *Headquarters Company.* Headquarters company consists of a company headquarters, a personnel and administration section, a maintenance section, and a survey platoon. The company provides survey information required by a field army (fig. 17).

c. *Mobility.* This unit is 100 percent mobile and 100 percent air transportable in medium transport aircraft.



NOT INCLUDED IN REDUCED STRENGTH ORGANIZATION.

Figure 17. (Superseded) Headquarters and headquarters company.

62. Engineer Photomapping Company, Army

* * * * *

b. The company is approximately 85 percent mobile * * * basic designs, namely—

* * * * *

d. Company missions are—

* * * * *

(3) (Superseded) To perform final evaluation of aerial photography to determine its suitability for mapping purposes.

e. (Added) Individuals of this organization can engage in effective coordinated defense of the unit's area or installation.

63. Engineer Map Reproduction and Distribution Company, Army

* * * * *

b. (Superseded) This company is 80 percent mobile with organic equipment and personnel. Additional transportation support is required to move 33 men and a daily operational requirement of two tons of paper stock. Depot stockage of up to

600 tons of maps will require nonorganic transportation to move stocks. The company is 100 percent air transportable in medium transport aircraft. The map reproduction equipment of the company is mounted in van-type trucks of six basic designs, namely—

- (1) Camera.
- (2) Laboratory (and Opns Hq).
- (3) Map layout.
- (4) Photomechanical.
- (5) Plate process.
- (6) Offset press.

c. (Superseded) The mission of the map reproduction and distribution company, army, is to reproduce, store, and distribute new and existing maps, map substitutes, photomaps, overlays, and other engineer intelligence and terrain intelligence material. Individuals of this company can engage in effective, coordinated defense of the unit's area or installation.

66. Intelligence

a. The **operations and intelligence** section of * * * and survey information.

b. The **operations officer (S-3)** performs additional duties as the **engineer intelligence officer (S-2)**. He is responsible to the battalion commander for the following intelligence activities:

* * * * *

d. The **operations and intelligence** section staffs the army survey information center. The section interprets * * * engineer intelligence reports.

69. Maintenance

* * * * *

c. The maintenance section, under the staff supervision of the battalion supply officer, is directly supervised by an **engineer maintenance officer**. Enlisted personnel of * * * of the battalion.

d. (Superseded) Repair parts supply is an important part of maintenance. The battalion maintenance section chief works in close coordination with the supply section to maintain effective repair parts supply. Repair parts are normally obtained from the direct support maintenance companies of the field army support command (FASCOM).

* * * * *

70. Map Distribution

(Superseded)

The battalion map reproduction officer, who is also an assistant S3, is the principal advisor to the battalion commander on all matters affecting the distribution of maps. In coordination with the intelligence and mapping element of the army engineer section, he prepares the map distribution plan for the army map depot which is operated by the map distribution platoon of the engineer reproduction and map distribution company. At the direction of the battalion commander, the battalion map reproduction officer makes periodic inspections of the operation of the map distribution system of the army map depot, to include periodic checks on initial and replenishment allowances, stock levels, security measures, and delivery schedules. He also maintains liaison with base and corps map depots.

75. Aviation Requirements

(Superseded)

Whenever aircraft are required and authorized in support of the topographic battalion, they are provided by appropriate cellular teams of TOE 29-500.

76. Aircraft Employment

(Superseded)

Aircraft employed by the battalion are used primarily to—

a. Provide lift for survey teams performing topographic surveys in areas inaccessible by road or when speed is essential.

b. Provide lift for rapid deployment and to speedily resupply survey sections operating in the field.

c. Perform preliminary aerial reconnaissance of assigned areas prior to actual ground survey by survey sections.

d. Furnish lift for special equipment, including electronic survey instruments, when required for the accomplishment of the survey mission.

e. Provide a means for the commander and other personnel to adequately supervise the survey operations.

80. Mobility

This unit is * * * the cargo vehicles. This unit is 100 percent air transportable in **medium transport** aircraft.

86. Company Headquarters

* * * * *

b. (Superseded) Company headquarters consists of the company commander, executive officer, first sergeant, and the personnel necessary to perform the headquarters support functions.

87. Capabilities

* * * * *

b. Besides its normal housekeeping equipment, company headquarters has tool sets for organizational maintenance; electrician and pipefitting sets for improvement of local facilities; and a 2½-ton water truck for operational purposes. The reproduction platoon * * * map storage requirements.

* * * * *

88. Reproduction Platoon

* * * * *

c. (Superseded) Personnel comprising the reproduction platoon are as follows:

(1) *Platoon headquarters.* Map reproduction technician warrant officer (platoon leader), photolithographic supervisor, photolithographic foreman, power generator operator, reproduction equipment repairman, and bindery specialist (power cutter operator).

- (2) *Photographic section.* Photolithographic foreman, senior process photographers, photographers, and helpers.
- (3) *Plate and layout section.* Senior plate-makers, platemakers, and helpers.
- (4) *Press section.* Offset press supervisor, offset press foreman, offset pressmen, and helpers.

89. Reproduction Platoon Operations

* * * * *

b. (Superseded) The platoon leader also receives incoming work from the photomapping company and orders for re-runs of existing maps. He assigns production phases to the sections, supervises the work, and checks to see that deadlines are met.

* * * * *

90. Map Distribution Platoon

* * * * *

c. (Superseded) The platoon consists of a platoon headquarters and a storage and distribution section organized as follows:

- (1) *Platoon headquarters.* Platoon headquarters consists of the platoon leader, platoon sergeant, supply specialists, supply clerks, and a packing and crating specialist.
- (2) *Storage and distribution section.* The section consists of the warehouse foreman, supply specialist, packing and crating specialists, warehousemen, and warehouse equipment operators.

d. Rescinded

91. Map Distribution Platoon Operations

* * * * *

b. The platoon leader, assisted by the **platoon sergeant**—

* * * * *

c. The **warehouse foreman**, assisted by the supply clerks, handlers, and warehousemen—

* * * * *

d. (Superseded) The senior engineer supply specialist, assisted by the supply specialists and warehouse personnel, breaks down and schedules the delivery of bulk map shipments by counting, packaging, addressing, and shipping to army units and corps distribution points.

93. Reorganization for Combat

The purpose of * * * of an area.

a. (Superseded) An SOP for reorganizing the battalion for combat is outlined in appendix III.

* * * * *

d. (Superseded) The photomapping and map reproduction and distribution companies, less their rear echelons, are organized as rifle companies. Each company consists of a company headquarters and two rifle platoons. Each platoon consists of a platoon headquarters, three rifle squads, and a weapons squad. Headquarters company, less the personnel required for battalion headquarters and those in the rear echelon, is similarly organized. Radios from headquarters and headquarters company are distributed among the three companies to achieve a balanced radio communication capability.

e. The battalion security * * * areas become untenable. The battalion **map reproduction**, supply, and **motor** officers are normally assigned to the security echelon.

* * * * *

i. The reorganization plan * * * defense area headquarters. **On alert, all topographic work ceases.** Engineer equipment is * * * battalion supply officer.

* * * * *

95. Defense Against Air Attack

(Superseded)

Defensive measures by the battalion consist principally of developing a passive air defense. This type of defense is directed toward the protection of personnel and equipment by training personnel in aircraft recognition; digging prone emplacements for personnel near working areas and bivouacs; dispersing vehicles and equipment; concealing bivouacs and working areas; providing an effective warning system; and camouflage. Active air defense is limited to engaging low-flying hostile aircraft with small arms fire.

96. Defense Against Chemical Attack

(Superseded)

a. Defensive measures by the battalion consist of providing CBR protective shelters as deemed necessary by the battalion commander; providing a warning system; training in use of protective equipment; damage control (particularly prompt fire-fighting in case of incendiary attack); and decontamination of personnel, equipment, and necessary areas.

b. During a chemical attack, the most important action is the enforcement of CBR discipline requiring battalion personnel to make full use of

protective equipment and facilities. Prompt fire-fighting is required in case of incendiary attack.

c. After the attack, personnel take necessary first aid measures such as use of atropine for nerve agent poisoning and protective ointment for removal of blister agents, and perform necessary personal decontamination. The battalion aid station renders first aid to affected personnel, and selected squads detect and mark contaminated areas. Other squads decontaminate areas, installations, and equipment necessary to reconstruct installations and defensive works and to continue the battalion's mission. See FM 21-40 for guidance on defensive measures and FM 21-41 for procedures.

97. Defense Against Nuclear or Radiological Attack

* * * * *

b. Where there is danger of nuclear attack, action is taken to see that—

* * * * *

(7) **Protective** shelters are prepared for use, when practicable.

* * * * *

c. After the attack * * * are described in FM 21-40 and TM 3-220.

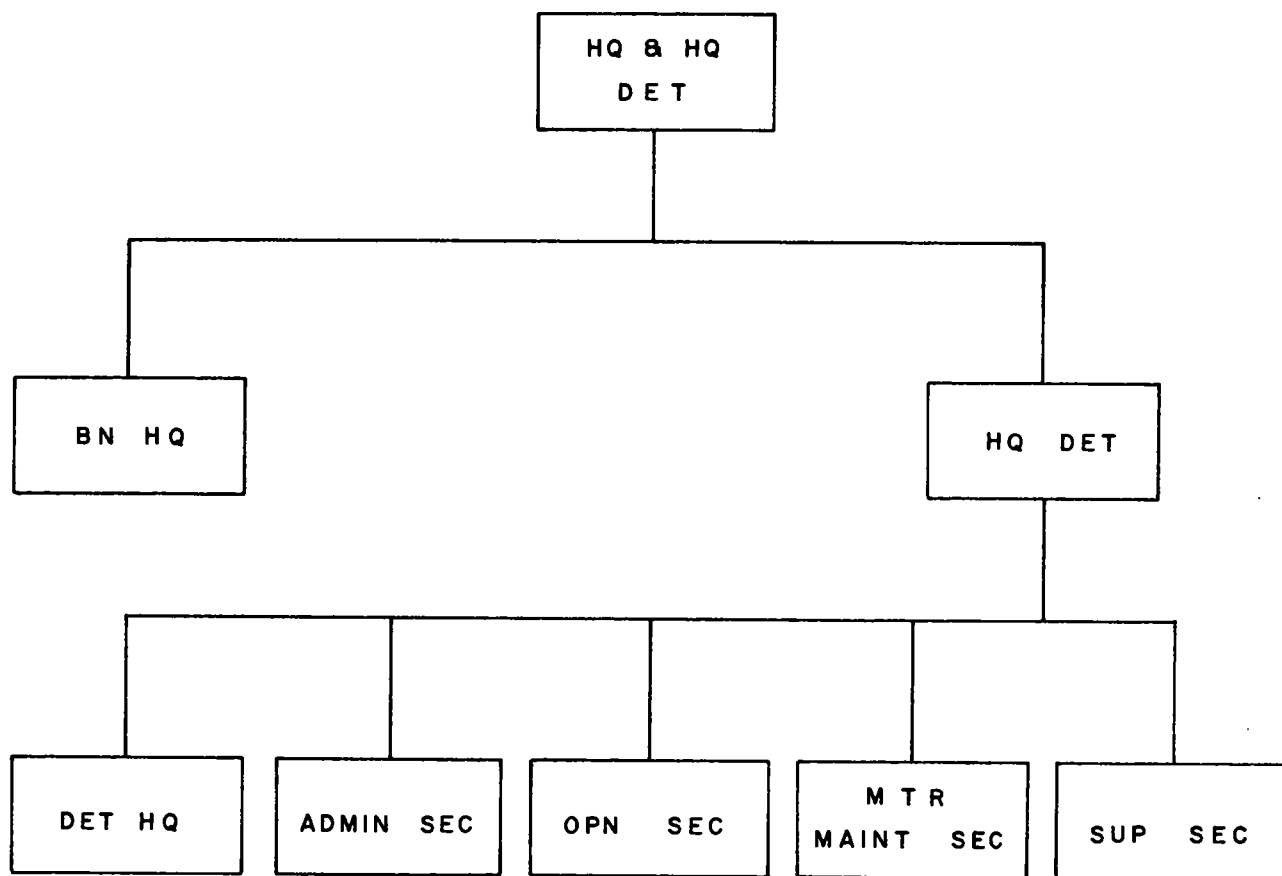


Figure 21. (Superseded) Headquarters and headquarters detachment.

103. Battalion Headquarters

* * * * *

f. The battalion headquarters * * * for the battalion.

g. (Added) Aircraft support is provided by augmentation with TOE 29-500 cellular teams when required and authorized by appropriate commanders.

105. The Battalion Staff Sections

(Superseded)

Personnel of the battalion staff sections are provided by the headquarters detachment. These sections are the administrative, operations, motor maintenance, and supply sections.

106. Detachment Headquarters

(Superseded)

Detachment headquarters is organized to provide its own administration and mess facilities for headquarters and headquarters detachment, the map depot company, the reproduction company, the photomapping company, and any attached TOE 5-500 teams.

109. Motor Maintenance Section

(Superseded)

The motor maintenance section consists of a motor maintenance sergeant, wheeled vehicle mechanics, and helpers. It provides organizational maintenance for the vehicles of the map depot, reproductions, and photomapping companies.

113. Mobility

(Superseded)

Since it is designed for operation at a fixed installa-

tion, the company is only 9 percent mobile in organic transportation. It is 100 percent air transportable in medium transport aircraft.

114. Capabilities

At full strength * * * the following capabilities:

* * * * *

e. (Superseded) Performs organizational and direct support maintenance of organic photomapping equipment.

f. (Superseded) Extends ground control for artillery and missile fire by photogrammetric means to produce gridded graphics.

g. (Added) Evaluates aerial photography to determine its suitability for mapping purposes.

h. (Added) Compiles and produces base map material for engineer intelligence and terrain studies.

115. Company Headquarters

(Superseded)

Company headquarters provides the command, administration, supply, utilities, and operational support for the two photomapping platoons. All of the equipment of the company, except the individual weapons of the personnel of the two platoons, is in company headquarters.

119. Mobility

(Superseded)

The engineer base survey company is 100 percent mobile utilizing organic vehicles and 100 percent air transportable in medium transport aircraft.

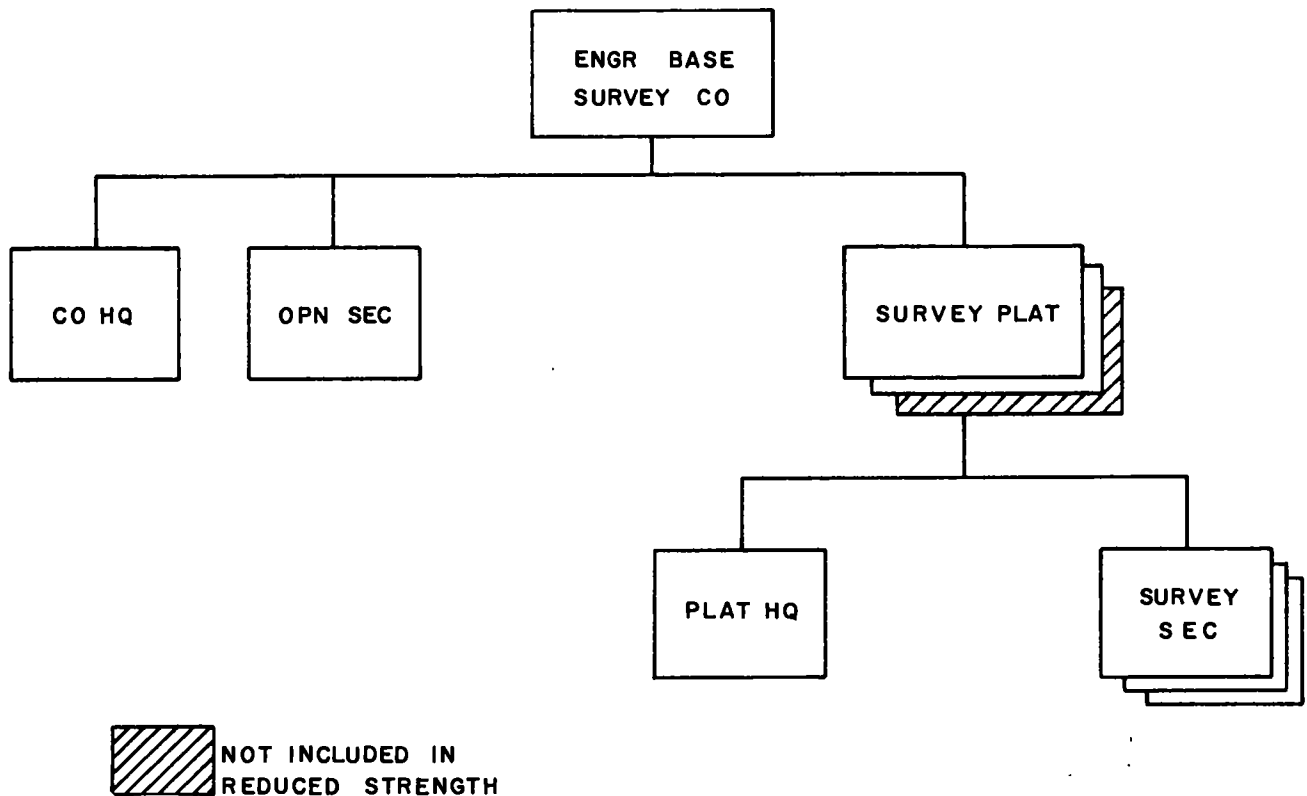


Figure 23. (Superseded) Engineer base survey company.

120. Capabilities

At full strength this unit is capable of —

* * * * *

g. Rescinded

* * * * *

124. Survey Platoon Operations

* * * * *

b. (Superseded) There are three survey platoons, each organized into a platoon headquarters and three survey sections.

c. (Superseded) Personnel of each of the three platoons are as follows:

- (1) *Platoon headquarters.* Platoon leader (survey technician), survey supervisor, topographic computers, riggers, carpenter, and radio-telephone operator.
- (2) *Survey sections.* Each survey section is composed of a section chief, two topographic computers, three topographic surveyors, three topographic recorders, and three rodmen-tapemen.

125. Aviation Requirements

(Superseded)

Aviation support may be required for survey operations for the reasons outlined in paragraph 76. When required and when authorized, aircraft are provided by appropriate cellular teams of TOE 29-500.

129. Mobility

(Superseded)

Since it is designed for operation at a fixed installation, the company is only 18 percent mobile in organic transportation. It is 100 percent air transportable in medium transport aircraft.

131. Company Headquarters

(Superseded)

The company headquarters consists of the company commander, the executive officer—who is also the operations officer—the first sergeant, a generator specialist, a forklift operator, a bindery specialist (power cutter operator), a supply sergeant and supply specialist, a reproduction clerk, and a vehicle operator. The company is dependent on the engineer base topographic battalion for messing and for motor vehicle maintenance. The reproduction

equipment repairmen are assigned to the reproduction platoons.

135. Mobility

(Superseded)

This company is approximately 22 percent mobile in organic transportation and 100 percent air transportable in medium transport aircraft when equipment is disassembled.

137. Company Headquarters

(Superseded)

Company headquarters consists of the company

commander, first sergeant, supply sergeant and specialist, personnel specialist, and light vehicle driver. The unit is dependent on the engineer base topographic battalion for messing and for organizational maintenance of organic vehicles that is not performed by the vehicle operators. When elements of the map depot company are operating away from the battalion, provisions for messing and maintenance must be made by attachment to a nearby unit or by attaching teams from the appropriate TOE 500-series.

Section VII. REORGANIZATION FOR COMBAT (SUPERSEDED)

139. General

The engineer base topographic battalion and its component companies are responsible for their own local security and must be prepared to fight in self defense. Normally, the battalion headquarters and headquarters detachment, the photomapping company, and the reproduction company are at the same location or near enough to each other to engage in a united defense effort. However, while the company headquarters of the map depot company and the base survey company may be located near battalion headquarters, major elements of these companies normally operate at widely separated locations in the communications zone. As a result, these two companies will seldom function as a unit in combat. In an emergency, such as a break-

through, personnel of the battalion and its companies may be called on to serve as infantry replacements in combat units.

140. Reorganization for Combat

Plans (SOP) for combat should be maintained by the battalion and its elements for those occasions when combat as a unit would be required. Such plans may be patterned after the reorganization for combat of the army topographic battalion shown in appendix III.

141. Defensive Measures

Paragraphs 94 through 98 discuss the defensive measures that should be employed against various types of attack.

APPENDIX I

REFERENCES

(SUPERSEDED)

1. Department of the Army Pamphlets (DA Pam)

310-series	Military Publications.
750-1	Preventive Maintenance Guide for Commanders.

2. Army Regulations and Special Regulations (AR)

117-5	Military Mapping and Geodesy.
320-5	Dictionary of United States Army Terms.
320-50	Authorized Abbreviations and Brevity Codes.
350-1	Army Training Policies.
380-5	Safeguarding Defense Information.
750-1	Maintenance Concepts.
750-8	Command Maintenance Management Inspections.

3. Field Manuals (FM)

3-5	Chemical, Biological, and Radiological (CBR) Operations.
3-8	Chemical Corps Reference Handbook.
3-10	Chemical and Biological Weapons Employment.
3-12	Operational Aspects of Radiological Defense.
5-1	Engineer Troop Organizations and Operations.
5-20	Camouflage, Basic Principles and Field Camouflage.
5-36	Route Reconnaissance and Classification.
5-135	Engineer Battalion, Armored, Mechanized, and Infantry Divisions.
6-2	Artillery Survey.
6-20-1	Field Artillery Tactics.
6-20-2	Field Artillery Techniques.
(C)6-37	Field Artillery Missile Battalion SERGEANT (U).
(S)6-39	Field Artillery Battalion (PERSHING) (U).
(C)6-40-2	Field Artillery Missile Gunnery (U).
6-120	The Field Artillery Target Acquisition Battalion and Batteries.
6-121	Field Artillery Target Acquisition.
7-11	Rifle Company, Infantry, Airborne Infantry and Mechanized Infantry.
7-15	Infantry, Airborne Infantry, and Mechanized Infantry, Rifle Platoons and Squads.
7-20	Infantry, Airborne Infantry, and Mechanized Infantry.
7-30	Infantry, Airborne, and Mechanized Division Brigades.
20-32	Land Mine Warfare.
21-5	Military Training Management.
21-6	Techniques of Military Instruction.
21-26	Map Reading.
21-30	Military Symbols.
21-31	Topographic Symbols.
21-40	Small Unit Procedures in Chemical, Biological and Radiological (CBR) Operations.

21-41	Soldier's Handbook for Chemical and Biological Operations and Nuclear Warfare.
21-48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises.
31-16	Counter guerrilla Operations.
31-22	U.S. Army Counterinsurgency Forces.
(S)31-22A	U.S. Army Counterinsurgency Forces (U).
31-25	Desert Operations.
31-30	Jungle Training and Operations.
31-70	Basic Cold Weather Manual.
55-35	Motor Transport Operations and Motor Transport Units.
100-5	Field Service Regulations—Operations.
100-10	Field Service Regulations, Administration.
(C)100-20	Field Service Regulations—Counterinsurgency (U)
101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
101-10-1	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data—Unclassified Data.

4. Technical Manuals (TM)

3-210	Fallout Prediction.
3-220	Chemical, Biological and Radiological (CBR) Decontamination.
3-350	Improvised CBR Protective Shelters.
5-230	General Drafting.
5-231	Mapping Functions of the Corps of Engineers.
5-232	Elements of Surveying.
5-233	Construction Surveying.
5-235	Special Surveys.
5-236	Surveying Tables and Graphs.
5-239	High Precision Military Stereoplotter.
5-240	Map Compilation, Color Separation, and Revision.
5-241-1	Grids and Grid References.
5-241-8	Universal Transverse Mercator Grid.
5-243	Cartographic Aerial Photography.
5-244	Multiplex Mapping.
5-245	Map Reproduction.
5-248	Foreign Maps.
5-311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations).
5-441	Topographic Surveying.
5-6001 to 5-6054	Reproduction Equipment; Technical Manuals Issued with TOE Equipment.
21-305	Manual for the Wheeled Vehicle Driver.
30-245	Photographic Interpretation Handbook.
30-246	Tactical Interpretation of Air Photos.
30-252	Photographic Interpretation Manual: Photographic Metrics.

5. Army Training Programs (ATP)

5-305	Engineer Topographic Units.
21-114	Male Military Personnel Without Prior Service.
21-160	Cadre Training.

6. Tables of Organization and Equipment (TOE)

5-305	Engineer Topographic Battalion, Army.
5-306	Headquarters and Headquarters Company, Engineer Topographic Battalion, Army.
5-307	Engineer Map Reproduction and Distribution Company, Army.

5-308	Engineer Photomapping Company, Army.
5-327	Engineer Topographic Company, Corps.
5-344	Engineer Base Map Depot Company.
5-346	Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion.
5-347	Engineer Base Reproduction Company.
5-348	Engineer Base Survey Company.
5-349	Engineer Base Photomapping Company.
5-500	Engineer Service Organization, Part 7, Topographic Teams.



APPENDIX II

TYPICAL SOP FOR AN ENGINEER TOPOGRAPHIC BATTALION

5. OPERATIONS

* * * * *

b. Security

* * * * *

(2) Bivouac

* * * * *

(b) When battalion is * * * and CBR agents. Security company will enforce camouflage discipline. Troops fire on * * * 50 yards apart.

(3) Motor movements

* * * * *

(b) (Superseded) During air attack by day, vehicles will continue movement. At night, when illuminated by flares, all movement will cease; troops will keep their heads down.

(c) (Superseded) At halts all troops will dismount. Each motor column unit will post sentinels to front, rear, and flanks.

(4) Working areas.

* * * * *

(b) (Superseded) Officer or NCO in charge of each working area will be responsible for posting air guards, maintaining camouflage discipline, and for proper alert measures.

* * * * *



APPENDIX III

(SUPERSEDED)

ANNEX 10 (REORGANIZATION FOR COMBAT) to SOP _____ Engineer Topographic Battalion

1. PURPOSE

The purpose of reorganizing the battalion for combat is to prepare the battalion for defense of its bivouac and working areas.

2. REFERENCES

SOP and training memoranda of this battalion and training memoranda of Engineer Section _____ Army; FM's 7-11, 7-15, and 7-20.

3. ALERT

The battalion reorganizes for combat upon receipt of an alert from _____ Army or when attack is imminent.

4. COMPANY PLANS

Companies will include in their SOP's plans for reorganization for combat based on this annex. Specific duties for all personnel in the company will be established.

5. ORGANIZATION

The battalion will be reorganized into two echelons: a combat or forward echelon and a rear echelon.

a. The forward echelon will consist of a battalion headquarters and three rifle companies.

b. The rear echelon will consist of those administrative and maintenance personnel not required in the forward echelon.

6. BATTALION COMBAT HEADQUARTERS

Battalion headquarters will consist of a command section, an administrative section, a communications section, an operations-intelligence section, and an ammunition section.

7. HEADQUARTERS COMPANY COMBAT ECHELON

Headquarters company, less those personnel required for battalion headquarters and the rear echelon, will be organized as a rifle company consisting of a company headquarters and two rifle platoons. Each platoon will consist of a platoon headquarters (platoon leader, platoon sergeant, and radio operator), 3 rifle squads of 10 men each, and a weapons squad of 10 men. The weapons squad will consist of two 3-man rocket launcher teams and two 2-man automatic rifle teams. Automatic rifles excess to the needs of the weapons squads (11) will be distributed as follows: one to each rifle squad (6) and 5 to the photomapping company. Headquarters company will furnish one 3.5-inch rocket launcher with 3-man crew to the photomapping company.

8. ENGINEER PHOTOMAPPING AND MAP REPRODUCTION AND DISTRIBUTION COMPANIES COMBAT ECHELONS

These companies less their rear echelon personnel will be organized as rifle companies similar to headquarters company. However, the weapons squad of one of the platoons in each company will have only one 3.5-inch rocket launcher. Automatic rifles excess to the needs of the weapons squads will be distributed to the rifle squads.

9. REAR ECHELON

- a. The battalion map distribution officer will command the rear echelon.
- b. The rear echelon will be responsible for firefighting, damage control, preparation and distribution of rations, supply, and preparation of equipment for destruction or evacuation in the event that the work and bivouac areas become untenable.

10. COMMUNICATIONS

- a. Headquarters company will furnish each of the other companies one AN/VRC-46 mounted in a $\frac{3}{4}$ -ton truck and six AN/PRC-25's.
- b. Headquarters company will allocate to the rear echelon one AN/VRC-46 mounted in a $\frac{3}{4}$ -ton truck.
- c. Communications section, battalion headquarters, will provide telephone service from battalion to company command posts.
- d. Communication between companies and platoons will be by radio and messenger.

11. ENGINEER WORK AND EQUIPMENT

- a. On alert, all topographic work will cease.
- b. Topographic equipment will be evacuated to a location designated by the rear echelon commander.
- c. Individuals will retain full field equipment. All other individual equipment will be stored in an area designated by the battalion supply officer.

12. SUPPLY

- a. Rations and water will be supplied to the combat echelon by the rear echelon. When the situation permits, hot meals will be furnished.
- b. Ammunition supply will be controlled by the ammunition section of battalion headquarters. Transportation and loading personnel for ammunition will be furnished by the rear echelon. Ammunition will be moved directly from rear ammunition dumps to company supply points.
- c. Other supplies needed by the combat echelon will be sent forward by the battalion supply officer from the rear echelon area.

13. TRAINING

Reorganization for combat under this plan will be rehearsed during all combat training exercises.

By Order of the Secretary of the Army:

Official:

J. C. LAMBERT,
*Major General, United States Army,
The Adjutant General.*

HAROLD K. JOHNSON,
*General, United States Army,
Chief of Staff.*

Distribution:

Active Army:

DCSPER (2)	USACDCCEA (2)	MDW (1)
ACSI (2)	USACDCINTA (1)	Armies (25)
DCSLOG (2)	USACDCARMA (5)	Corps (15)
DCSOPS (2)	USACDCCARMSA (2)	Div (10)
ACSFOR (2)	USACDCOA (2)	Div Arty (5)
CORC (2)	USACDCQMA (2)	Engr Bde (5)
CRD (1)	USACDCIA (30)	Engr Gp (5)
COA (1)	USACDCTA (2)	Engr Bn (2) except
CINFO (1)	USACDCMPA (1)	TOE 5-305 (15)
TIG (1)	USCONARC (10)	5-306 (20)
TJAG (1)	USAMC (15)	Engr Co (1) except
TPMG (1)	USACDC (10)	TOE 5-327 (15)
TSG (1)	USACDCIAS (1)	USATC (10)
OPO (1)	USACDCEC (10)	AMS (10)
CofEngrs (3)	USACDCCISG (1)	Joint Sch (15)
USACDCMSA (5)	USACDCCSSG (5)	USMA (100)
USACDCADA (1)	USACDCCAG (10)	Br Svc Sch (10) except
USACDCARTYA (3)	ARADCOM (10)	USAES (55)
USACDCAVNA (5)	ARADCOM Rgn (10)	USAARMS (25)
USACDCCBRA (5)	OS Maj Comd (5)	USAREUR Engr Topo Ctr (100)
USACDCSWA (5)	LOGCOMD (5)	

NG: None.

USAR: Units—same as active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

☆ U.S. Government Printing Office: 1965—200502

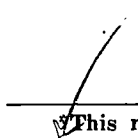
FIELD MANUAL

No. 5-146

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 October 1963

ENGINEER TOPOGRAPHIC UNITS

	Paragraphs	Page
CHAPTER 1. ENGINEER TOPOGRAPHIC SYSTEM	1-5	1
2. RESPONSIBILITIES FOR AND CONTROL OF MAP REPRODUCTION	6-8	2
3. TOPOGRAPHIC OPERATIONS, GENERAL		
Section I. Map production planning and operation	9-21	9
II. Special problems	22-33	17
CHAPTER 4. ENGINEER TOPOGRAPHIC ORGANIZATION	34-39	23
ENGINEER TOPOGRAPHIC COMPANY, CORPS		
Section I. Organization	40-43	25
II. Company operations, general	44-47	26
III. Technical operations	48-52	27
IV. Tactical operations	53-55	33
CHAPTER 6. ENGINEER TOPOGRAPHIC BATTALION, ARMY		
Section I. Organization	56-63	35
II. Battalion operations	64-70	38
III. Headquarters and headquarters company	71-77	43
IV. Engineer photomapping company, army	78-85	46
V. Engineer map reproduction and distribution company, army	86-91	48
VI. Tactical operations	92-98	51
CHAPTER 7. ENGINEER BASE TOPOGRAPHIC BATTALION		
Section I. Organization	99-102	55
II. Operations	103-110	56
III. Engineer base photomapping company	111-116	59
IV. Engineer base survey company	117-126	60
V. Engineer base reproduction company	127-132	62
VI. Engineer base map depot company	133-138	64
VII. Tactical operations	139-141	65
CHAPTER 8. ENGINEER TOPOGRAPHIC TEAMS	142-150	67
9. COORDINATING TOPOGRAPHIC SERVICES	151-154	69
10. TRAINING		
Section I. General	155-159	70
II. Army training program	160-165	70
III. Postcycle training	166-170	72
APPENDIX I. REFERENCES		74
II. TYPICAL SOP FOR AN ENGINEER TOPOGRAPHIC BATTALION		76
III. SOP ANNEX 10, REORGANIZATION FOR COMBAT		83
INDEX		86

 This manual supersedes FM 5-188, 12 April 1955.

CHAPTER 1

ENGINEER TOPOGRAPHIC SYSTEM

1. Purpose and Scope

This manual describes the mission, organization, training, and doctrine of employment of engineer topographic units. Throughout the manual, doctrine rather than technique is stressed. Flexibility in the employment of engineer topographic units, rather than adherence to rigid rules, is the best means for accomplishing the missions to assist—

a. Staffs of higher headquarters in the proper utilization and supervision of these units.

b. Topographic unit commanders and subordinate supervisory personnel to plan the training of personnel and to organize them into effective work units.

2. Specific Coverage

a. This manual outlines the mission, capabilities, organizational structure, and responsibilities and control of engineer topographic units. It describes the organization of all engineer topographic units, communications, and armament. Equipment has been described in general terms, omitting sizes and capacities which change periodically, and is better obtained from specific tables of organization and equipment (TOE).

b. It outlines the operations of engineer topographic units and develops in more detail how they are conducted in each unit and closely associated groups of units.

c. It contains the principles to be employed in training the personnel of engineer topographic units, both as individual members of the team and for close cooperation and teamwork. It outlines the training objectives and describes the means and methods available to the engineer commander and his staff in con-

ducting training programs, field exercises, and training tests. It lists the subjects in which individuals must be proficient in order to qualify for the various MOS's; and covers those aspects of advanced unit training peculiar to engineer topographic units.

3. Applicability

The material in this manual is applicable to nuclear and nonnuclear warfare.

4. Recommended Changes

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text to which they refer. Reasons should be provided for each comment to insure understanding and thorough evaluation. Comments should be forwarded directly to the Commanding Officer, U. S. Army Combat Developments Command Engineer Agency, Fort Belvoir, Virginia.

5. Topographic Services

The phrase "topographic services," as used in this manual, is defined as including all those services which any topographic unit, or the combination of different types of topographic units available to any command, is equipped and organized to render. This includes the reproduction of engineer or G2 documents related to providing information of the terrain, such as maps, overlays, sketches, reconnaissance diagrams, terrain studies and estimates, mapping survey annexes, photoprints, photomaps, mosaics, and overprints; the support of artillery, missile fire, and satellite operations by provision of geodetic control data, triangulation lists, control bulletins, and cataloging and supply of existing maps.

CHAPTER 2

RESPONSIBILITIES FOR AND CONTROL OF MAP REPRODUCTION

6. General

a. Cartography successfully took a long step forward from global mapping into space when a topographic map of the moon was produced. With this projection to other planets, modern military topography became even more complex and highly technical in nature. As has been proven in the past, long experience in topographic mapping is needed to deal intelligently with the technical aspects of the subject. The Director of Defense Intelligence Agency (DIA) exercises management control over DOD mapping, charting, and geodetic (MC&G) activities to include supervision of the execution of all approved MC&G plans, programs, policies and procedures. The Chief of Engineers is responsible to the DIA for the execution of this program.

b. The Assistant Chief of Staff for Intelligence is responsible for the military mapping program of any Department of the Army command. Under staff supervision of the G2, the engineer of the command is charged by the commander with the production, reproduction, and distribution of all maps, and engineer intelligence documents of the Department of the Army Intelligence program. He is assisted in the discharge of these duties by his mapping staff. The engineer and his staff should, in coordination with G2, establish for the Department of the Army and such other elements of the Department of the Defense as may be designated, a program within known engineer capabilities to give the most reasonable solution and accomplish the program by assigning mapping missions to topographic units under his control, and by requesting support of the Army Map Service. The topographic unit commander directs the operational phases of the mapping program in accordance with the procedures given in technical manuals and instructions received from higher authority through the engineer.

c. Military forces without adequate knowledge of the terrain and the area of operations

are severely handicapped. Military maps provide this information and are, in effect, intelligence documents. Engineer topographic units are governed by the "Military Standard Requisitioning and Issue Procedure" (MILSTRIP) AR 725-50, and the "Material Issue Priority System," throughout the logistic and command organization of the Department of the Army. These regulations contain Department of the Army instructions to accomplish the objective of one system of requisitioning, receipt, issue, and material movement. Map supply is included in MILSTRIP. Maps are distributed through map depots operated by topographic units except that within a division, the supply and transportation battalion of the division support command is responsible for map supply. Distribution tables are based on FM 101-10.

d. In order for the engineer to provide the necessary maps, he must be given the earliest possible warning of plans for a military operation. The time available during the planning of an operation normally will be sufficient only for revision and reproduction of available maps and hasty compilation of special maps required. The mapping program therefore must be planned to provide minimum usable map coverage over all possible areas of operations, with the provision for improvement as required by specific military plans.

7. Mapping Material

The theater engineer will obtain, whenever possible, direct from the Army Map Service all available material pertinent to the production of maps within the theater. The general map catalog of AMS carries indexes of all active map series for which reproduction material and map stocks are available. Published catalogs should be used as a guide only since they are subject to constant change. AMS library indexes indicate both inactive series and series for which library copies are available. Similar indexes should be obtained from

allied and local friendly sources. The engineer must establish a map library to which is added all new material, including maps compiled by other agencies. Copies of locally produced source materials and one set of reproducible new map sheets compiled therefrom are forwarded to the Army Map Service.

a. Surveys and Ground Control. Geodetic control is a highly important requirement for determining position and elevation of selected points for new mapping. The extent of required additional control will vary. In such thoroughly surveyed areas as western Europe little or none will be needed. In areas never previously surveyed however, complete horizontal and vertical control nets will be necessary. The engineer is responsible for assembling and maintaining complete files of

ground control data and for disseminating this data in usable form to all DOD agencies. This will include the providing of maps and trig lists, conventional ground surveys and the use of photogrammetric triangulation to extend ground control into the target area (fig. 1). Principal sources of data are the Army Map Service, captured material, friendly or allied agencies, and field work by engineer units. The extension of geodetic control is frequently prevented by natural or tactical obstacles or by lack of sufficient time. Existing control supplemented by lower order control and by photogrammetric triangulation must be relied upon in such cases. With the successful orbit and functioning of geodetic satellites, topographic units will have in the future a new and faster means of obtaining this data (fig. 2).

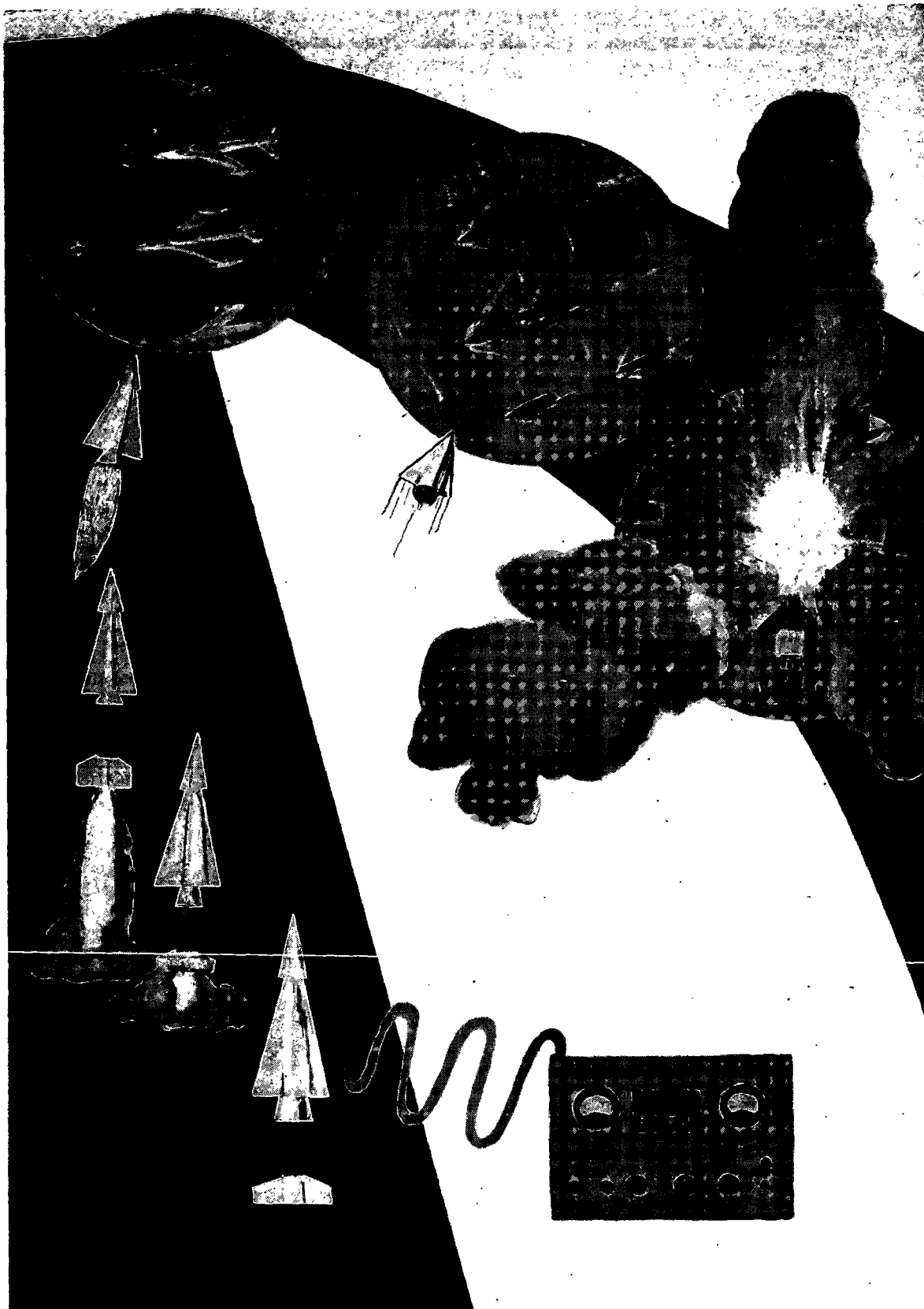


Figure 1. Topographic ground control into target area.

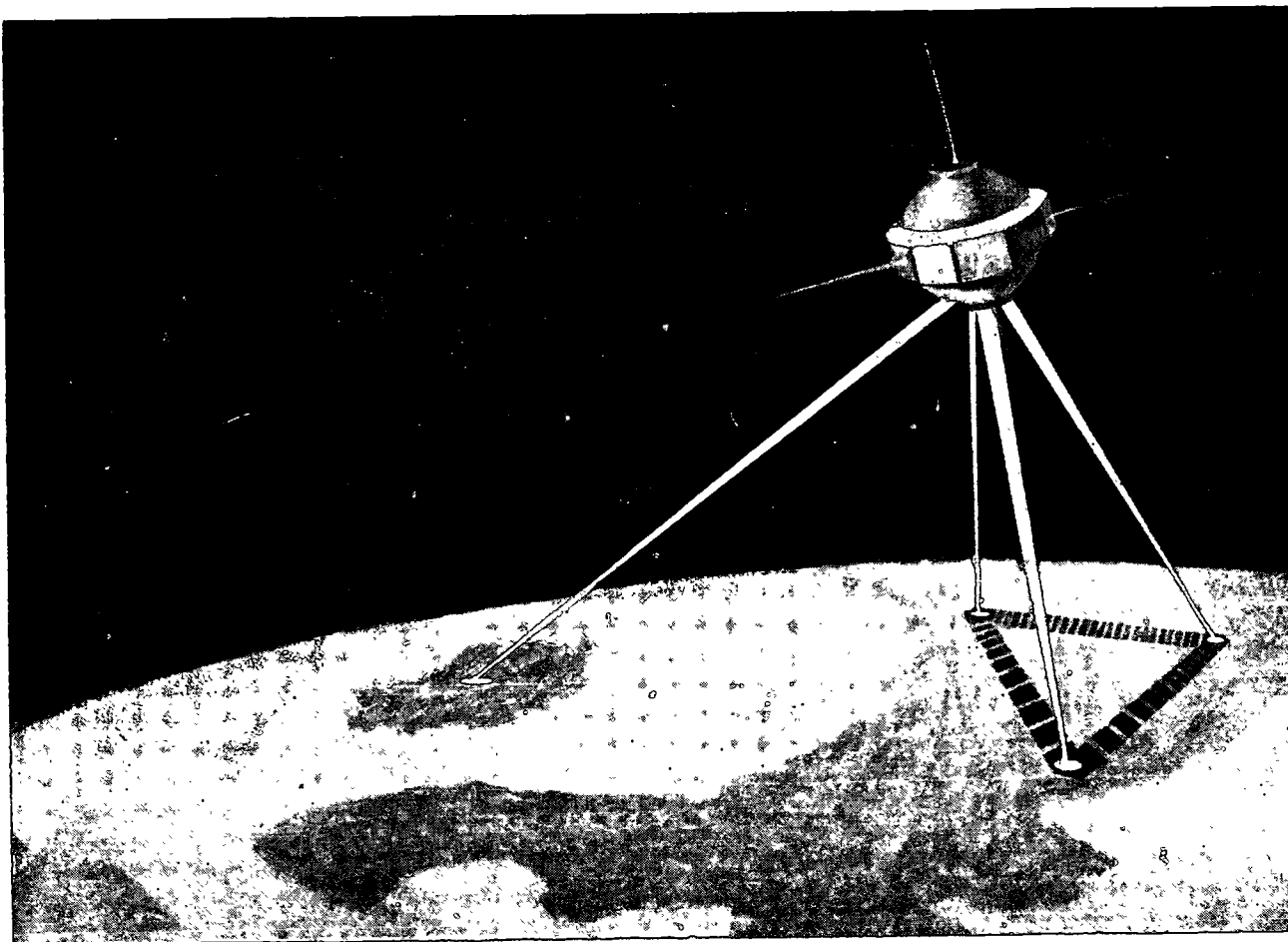


Figure 2. Future use of satellites in geodetic control was successfully extended and speeded by employing "ANNA" 1-B earth satellite (SECOR) to measure the earth's size, shape, and nature of the gravitational field.

b. Map Compilation. The principal agent for the compilation of new maps is the Army Map Service. Theater engineer topographic units, allied mapping agencies, and local contractors will supplement AMS production for local areas and special purpose mapping. Map revision, compilation, preparation of photo-maps and mosaics, and special site studies may be performed by field topographic units. All mapping agencies will be integrated to the maximum possible extent into the theater mapping program.

c. Map Reproduction. From the standpoint of the engineer, the problem of map reproduction is essentially that of providing sufficient press capacity and reproduction materials to meet estimated requirements. The map reproduction capacity of the zone of the in-

terior must be augmented in the theater by engineer topographic units and by exploitation of local facilities. Also a reserve press capacity of sufficient impressions per month must be provided to accomplish emergency topographic projects, as well as projects of such sensitivity that shipment from the zone of interior is undesirable.

d. Terrain Models and Relief Maps. Engineer model making units have limited production capability for making terrain models and plastic relief maps. In wartime, terrain models are in great demand for many phases of operational and technical planning. The production of terrain models is necessarily a time-consuming process involving much skilled hand labor. For most tactical purposes, plastic relief maps are an economical substitute and have proven extremely valuable (fig. 3).

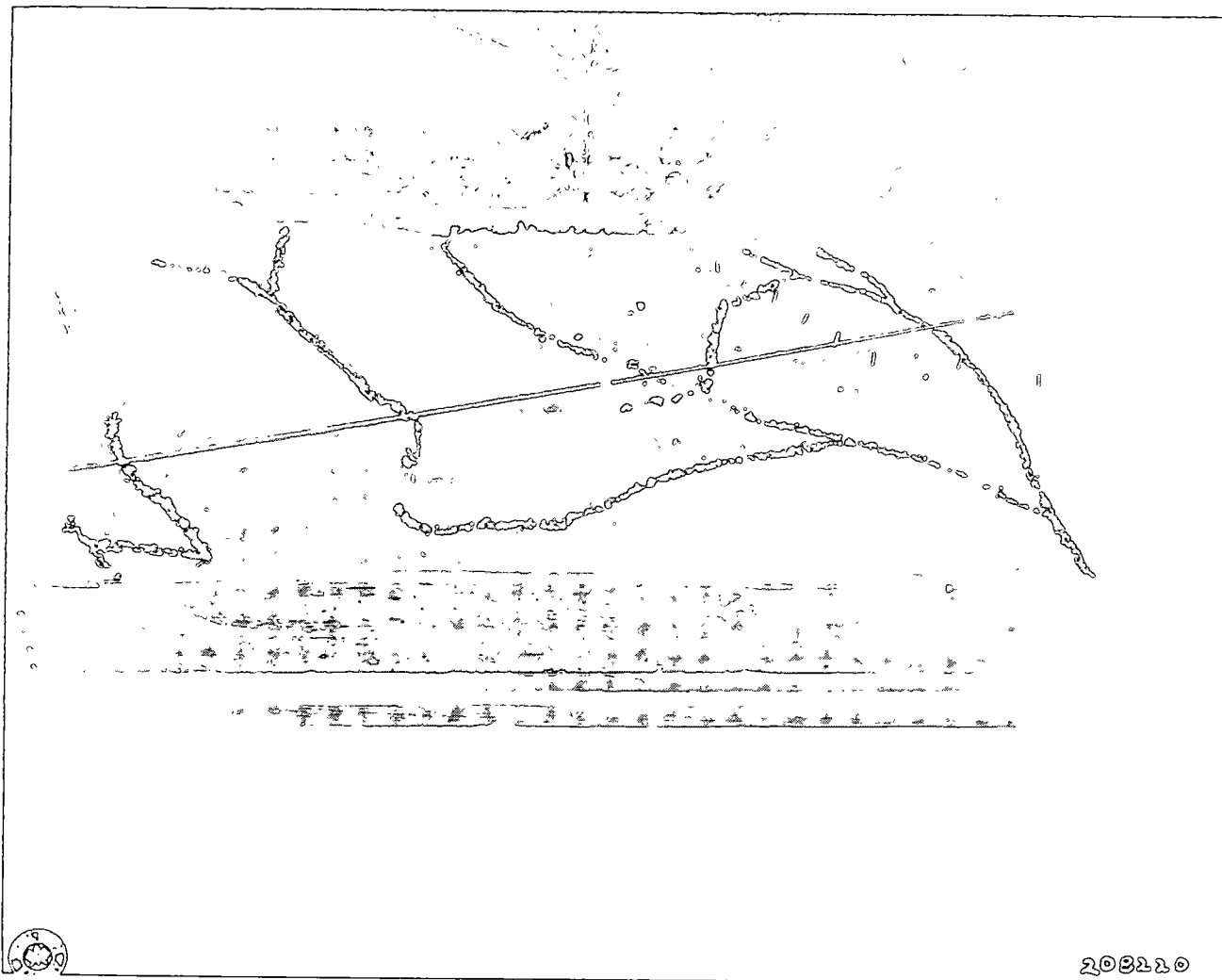


Figure 3. Plastic relief map and terrain table-mounted map.

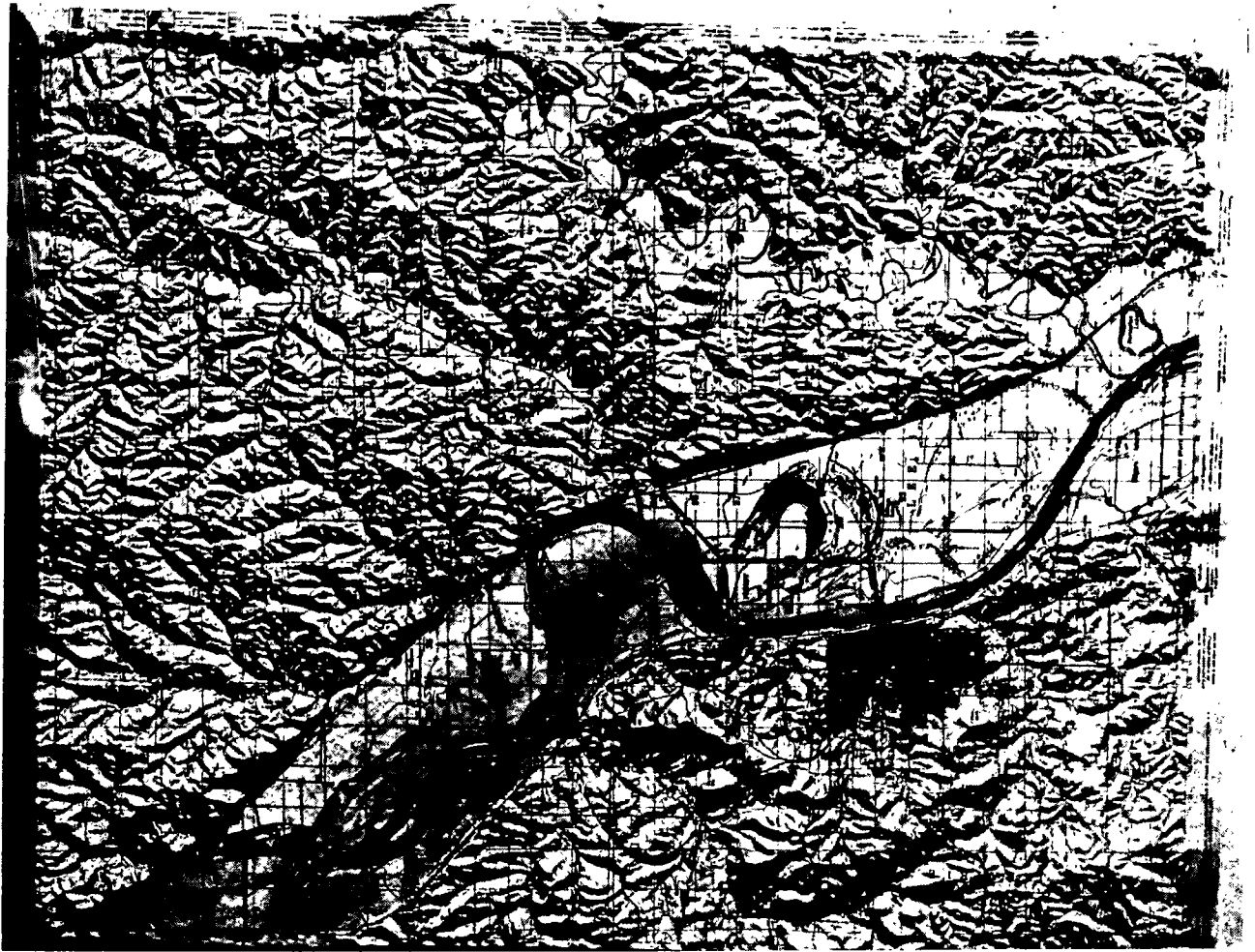


Figure 3 —Continued.

8. Development of Program

The mapping program is developed by consideration of the following:

a. Mapping requirements for all units of the command, including types, scales, and quantities of maps, aerial cartographic photography required, and requirements of ground control.

b. Existing map coverage and quality.

c. Maps and mapping support available from the zone of interior, including mapping

programs concurrently being undertaken by other services, agencies, and allied forces (fig. 4).

d. Number, type, phasing and capability of topographic troop units.

e. Local facilities available for contract.

f. Requirements of special and auxiliary equipment.

g. Requirements and phasing of topographic supplies.



Figure 4. Allied engineer topographic officers coordinating mapping support with U. S. engineer topographic officers.

CHAPTER 3

TOPOGRAPHIC OPERATIONS, GENERAL

Section I. MAP PRODUCTION PLANNING AND OPERATION

9. Centralized Control

Centralized control of all mapping operations within a command should be exercised by the engineer in the interest of efficiency, accuracy, uniformity of standards, and maximum production. Such control permits an economical integrated mapping program, and will prevent wasted effort on too many types of maps and production duplications. Control of map supply and distribution will avoid overtaxing reproduction capacities and paper supplies, and prevent excessive reserves or critical shortages. The actual distribution of maps, however, should be decentralized to permit major subordinate commands to control their own map depots, which should move forward with the tactical operation.

10. Topographic Staffs

Adequate topographic staffs should arrive in the theater early in order to determine requirements, establish mapping policies, and to initiate the theater mapping program. In a theater of operations, the intelligence division of the theater army engineer staff directs the activities of the topographic elements of the command. The intelligence division controls the operation of engineer base topographic units assigned to the theater and coordinates the activities of all engineer topographic units in the theater (TM 5-231).

11. Map Production Phases

In breaking down the mapping program, operations officers consider the functional organization of topographic units and the normal sequence of map production. These are—

a. The collection, collation, and evaluation of basic mapping data, including the procurement of aerial mapping photography and procurement or establishment of control.

b. The survey phase, including the establishment of horizontal and vertical ground con-

trol, and such plane table operations as may be necessary to fill in detail not covered by aerial photographs.

c. The photomapping phase, including the extension of control by photogrammetric methods, the compilation of map manuscripts, the preparation of final color separation and the editing of maps for publication.

d. The map reproduction phase, including reproduction in one or more colors.

e. Map supply and distribution includes distribution scheduling and stockage planning, requirement computation, stock control and records, initial replenishment and replacement issues, storage of regular and reserve stocks and other miscellaneous or special distribution operations.

12. Evaluation of Available Mapping Data

Before planning a new mapping program all available mapping material, including existing maps, aerial photographs, and ground control, should be obtained and evaluated. Foreign maps will normally require translation and out-of-date maps should be checked for pertinent information. Depending upon the amount of ground control available, on-the-ground control surveys may be unnecessary or impracticable. Existing coverage and quality of aerial photography is one of the prime considerations in any new mapping program. From a study of available mapping data, plans are initiated to provide for required additional aerial photographic coverage, ground control, and revision. A new map normally is evolved through all phases of map production.

13. Survey Phase

a. The various elements of surveying such as the determination of azimuths and astronomical positions, triangulation, traverse, leveling, plane table operations, and computations by grid and geodetic methods are the means

by which the engineer survey units contribute their share to the mapping program. Survey technique is well established by texts, technical manuals, and wide experience.

b. Survey unit commanders and engineer staffs are concerned not only with the degree of proficiency with which survey units can perform survey operations, but also with the selection and adaptation of survey methods to the particular problems in hand. The characteristics of the terrain, the time available, and the degree of accuracy required have a decided bearing upon the choice of method employed.

c. The appropriate engineer staff assembles and maintains complete files of ground control data and disseminates this data in usable form to engineer topographic units, the artillery, and other interested agencies. This data, commonly known as trig lists, is compiled from captured or friendly documents or from field data supplied by topographic survey units. Data collected from different sources is reduced to a common datum before incorporation in a trig list.

d. Generally, operations will be conducted in areas where some survey datum exists. Under such circumstances survey units will only be required to extend control throughout the area to be mapped. At times, however, operations may be conducted in unsurveyed areas. As a consequence, survey units will be required to establish either a first or second order survey datum, from which mapping control can be extended. The decision will depend on time available and size of area to be covered. The headquarters responsible for the overall mapping problem will decide what accuracy specifications a new datum will meet.

14. Photomapping Phase

a. Photomapping operations consist of applying map compilation, photogrammetric, photographic, and map drafting techniques to the preparation of maps. The operations begin with the extension of control by photogrammetric means, the compilation of data from aerial photographs, surveys, and other source

material, the preparation of final color separations, and the final edit of the completed map. The preparation of mosaics is also a photomapping operation. For details, see TM 5-240.

b. In the theater of operations military mapping is less frequently concerned with new mapping than with partial or total revision of maps which have been prepared by other agencies.

c. Engineer photomapping units should concentrate on establishing improved procedures for revising existing maps, constructing photomaps, and preparing map overlays, map substitutes, and overprints.

d. Photomapping engineer staffs should concentrate on obtaining good source material and improving procedures. The quality of the photomapping output and the time required to complete it depends upon the accuracy and amount of ground control supplied, the quality of the aerial photographs, and other source material. The state of training of the technical personnel, the condition of the technical equipment and supplies, and the physical conditions under which the work must be accomplished are also factors to be considered.

15. Map Reproduction Phase

a. Map reproduction operations include lithography, photography, and ammonia processes.

b. In scheduling reproduction work, engineer staffs should consider the differences between the equipment used by corps and army reproduction units, and that used by base units.

- (1) The corps reproduction unit and the army reproduction unit are 100 percent mobile. The van-type trucks are compactly designed, and the units have adequate equipment and can carry sufficient supplies to perform normal reproduction missions without curtailing their mobility. The map sizes, however, are limited to the sizes of the organic presses (normally 22½" x 30") and cameras.

- (2) The base reproduction units have reproduction equipment and 35- x 45-inch presses which are designed for stationary installation and high speed operations. When the units are moved to another site, a considerable period of time may be required to resume operations.

c. Since the map reproduction phase is essentially that of providing sufficient press capacity and reproduction materials, careful equipment and supply planning and scheduling are important responsibilities of the engineer staffs.

d. Engineer staffs should make provisions for a reserve press capacity of sufficient impressions per month to accomplish emergency projects.

e. Arrangements should be made by engineer staffs for the maximum exploitation of seized civilian lithographic printing plants, or purchase and contract facilities.

16. Map Planning, Supply, and Distribution Phase

a. Map and chart requirements for military use originate at the moment that military planners conceive of possible operations in the area affected. Thus, the ultimate success of map supply depends greatly upon prompt staff action, close coordination, and rigid control from the very start of the planning phase. The tactical commander's planning staff should recognize the relatively complex nature of map supply operations and draw upon the technical capabilities of the engineer staff at the earliest phase of planning. Rigid control over the final distribution phase is particularly vital because of the suddenness and frequency of change in conditions within the tactical area.

b. Maps are treated as intelligence documents. The assistant chief of staff for intelligence of each command is responsible for determining map requirements needed to support planned operations and assuring that adequate map materials can be made available. The engineer assists the ACSI in the compu-

tation of requirements and advises the planning staff on the technical aspects of map utilization.

c. The commander of the theater of operations establishes policies for the distribution of maps within the theater. Normally, base engineer map depots will be established in the theaters, and map stocks required from CONUS will be requisitioned from the Army Map Service by the theater engineer. The theater commander establishes priorities for air and surface shipment of maps and allied materials consistent with the theater map plan. Bulk distribution will be handled through map depots at various echelons. Map depots are usually provided as follows:

- (1) Base and advance depots located in the communications zone.
- (2) Army depots located in army service areas and operated by army topographic battalions.
- (3) Corps depots located in corps service areas and operated by corps topographic companies.

d. In ROAD divisions map supply is handled by the division support command. The division supply and transport battalion obtains maps for the division from the supporting map depot and distributes them to using units.

e. Bulk production, movement, and issue of maps are accurate indications of the scope and location of forthcoming operations. Consequently, appropriate security measures must be enforced in relation to map supply.

17. Production Capacities

a. In determining production capacities, engineer topographic unit commanders and their staffs should first consider the degree of accuracy and amount of detail required in the product. These factors will determine the time required to complete the project.

b. Other factors to be considered are —

- (1) Availability of topographic supplies and relative priority of work.

- (2) Serviceability of equipment.
- (3) Skill and training of technical personnel.
- (4) Efficiency and morale of the unit.
- (5) Suitability of working conditions.
- (6) Tactical situation encountered in the field.

18. Map Supply and Distribution Planning

a. Initial studies and preparations for map supply and distribution should be undertaken early in the planning phase of the mapping program. Tactical units are often unaware of their missions at the time map distribution must be arranged. Miscalculations will result in critical shortages or wasteful surpluses.

b. The assistant chief of staff, G2, issues the statement of policy for the command concerning initial map allowances, replenishment allowances, security measures, strategical plans of operations, tactical plans of operations, and lists of units involved in the distribution plan.

c. The engineer map supply and distribution plan should include—

- (1) The organization of the distribution system in the various echelons of command including the location of map depots.
- (2) Determination of initial and replenishment allowances.
- (3) Determination of stock levels and storage, including reserve stocks to meet reasonable contingencies.
- (4) Destruction of obsolete maps when replaced by new editions.
- (5) Security measures including packaging, coding, and guarding deliveries.
- (6) Delivery scheduling and transportation required.

- (7) Alternate plan in case operational plans are modified.

d. Unlike most logistic type items, maps and charts can only be used for operations in the area they cover. Forces assigned to operate in an area must be provided with maps and charts of that area and have no use for those maps of other areas, other than those on their immediate flanks and rear, and terrain held in depth by the enemy. Should these forces be relieved or reassigned to another area, they will require immediate issue of maps and charts required for operations in the new area. Moreover, in the conditions of modern warfare, maps and charts must be considered as expended once they have been issued to units, unless issued in bulk packets which can be held in a reserve status pending final distribution action. It is most unlikely that any significant quantity of unwanted maps or charts will be returned to map depots in a usable condition. Reserve stocks must, therefore, be sufficient to meet the needs of forces assigned to the area as well as any new forces which may be assigned to operate in the area during the first 90 days of operation.

e. In order to define essential stocks of maps to be held available, it is necessary to evaluate such factors as—

- (1) The essential map and chart series required for the operation.
- (2) The possible areas of operation in order of priority.
- (3) The maximum size of force for which map and chart stocks will be required.
- (4) The initial and replacement allowances considered adequate for standard type units with due consideration for the type of operation involved.
- (5) The time-frame required for replenishment of stocks.

f. Figure 5 illustrates a flow chart of map distribution in a theater of operations.

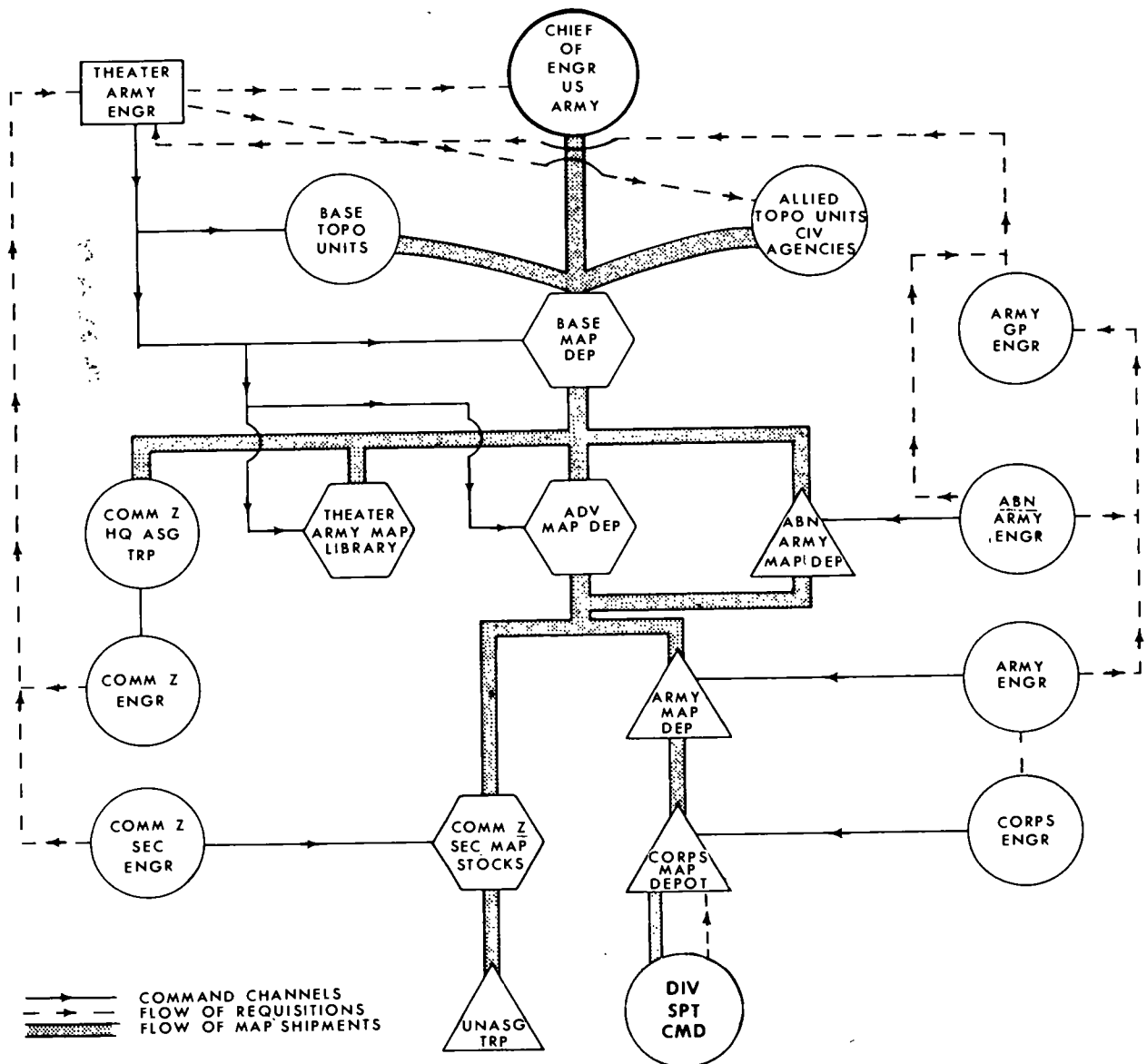


Figure 5. Flow chart of map distribution in a theater of operations.

19. Operational Methods

Paragraph 67 describes the flow of map production through the various battalion headquarters sections and the companies of the engineer topographic battalion, army. Appropriate technical manuals describe the technique of operational methods used in engineer topographic units. Normally, the work flows through the topographic unit in the sequence of the map production phases given in paragraph 67g.

20. Schedules, Reports, and Inspections

Time schedules, accurate and current reports, and command and technical staff inspections are essential to the control and coordination of the mapping program.

a. Detailed time schedules are prepared by the staff sections to control map production. These include labor scheduled for troop, indigenous, and prisoner-of-war labor when available; equipment schedules for the operation and maintenance of organic and local equip-

ment; and supply schedules for procurement, delivery, stocking, and issue of topographic supplies.

b. Accurate. current reports are essential for sound planning, skillful control, and proper supervision. However, reporting requirements should be carefully considered and be held to a minimum. A personal visit will often answer the purpose of a report and establish more friendly relations between staff and troop units.

c. Periodic reports, however, on personnel, equipment and supply, and the progress and completion of mapping operations are required by staff sections to check against schedules to—

- (1) Measure map production accomplished to date.
- (2) Determine rate of progress of map production in relation to compilation dates.
- (3) Analyze labor and equipment performance.
- (4) Estimate future mapping operations.
- (5) Prepare progress and completion reports for higher headquarters.

d. Command and technical staff inspections insure that plans and schedules are being met. The schedules, reports, and map production flow charts serve not only to control the map production phases but also to guide the topographic commander and his staff during their inspections.

- (1) Command inspections are made by battalion and company commanders to check the efficiency of personnel, insure compliance with prescribed operating procedures, determine if topographic equipment is efficiently assigned to tasks, and correct unsatisfactory conditions.
- (2) Technical staff inspections are made by staff personnel to insure adherence to mapping specifications, compliance with higher headquarters di-

rectives, the use of sound map production practice, and to determine the quality and completeness of map production.

21. Map Depot Operations

a. A map depot prepares and makes available bulk issues (wholesale) for receiving units (unit commands). The receiving unit performs the detailed breakdown and makes the individual issues. Map depots provide distribution facilities at each echelon of command down to and including the corps. Base, army, and corps depots each receive map stocks from the depot of the next higher echelon and from the engineer topographic units within its own command echelon.

b. Map depots are normally located in the service areas of their respective commands.

- (1) Base map depots are located in the communications zone of the theater of operations. The operating unit of this depot is the engineer base map depot company.
- (2) Army map depots are located in the army service area. There is normally one depot per army. The operating unit of this depot is the map distribution platoon of the engineer map reproduction and distribution company, army.
- (3) Corps map depots are located in the corps service area. There is normally one depot per corps. The operating unit of this depot is the map distribution section of the engineer topographic company, corps.

c. Depot sites should be located to provide adequate security, storage and work areas, and ease of operations. Access to the depot should be easy and well marked. Access roads to air, rail, or water transportation facilities should be considered when locating a depot to reduce transportation. Base map depots consistently shipping or receiving large quantities of maps should be located either at or near as possible to the most used transportation facility. Warehouses used for map storage should be weatherproof, secure against pilferage and sabotage, and have a floor bearing capacity equal to or

greater than the computed map storage load. Approximately 25 percent should be allowed over the computed storage area requirements for expansion to accommodate future new map productions, contingency, and rewarehousing operations. When computing map depot space requirements, all map publications in progress, but not completed, should be included in the volume figures to eliminate rewarehousing which would normally occur immediately upon setting up a depot. Space required for a depot to include all covered space requirements (office, receiving, shipping, aisle and storage areas) may be computed as one square foot of floor space for every 1,000 copies of maps to be stocked where containers are arranged 8 feet in height (which should

not be exceeded in a map depot) with 3-4 feet wide secondary aisles and 8 feet wide main aisles. Storage areas should be arranged into container rows not to exceed 30 feet in length to provide efficient operations by minimizing transportation and providing easy access to containers. A main aisle should either traverse the storage area or extend through the depot from the receiving to the shipping areas for efficient work flow and use of handling equipment. Office space should be provided on the basis of number of personnel required for stock control and administration. Normally, 300-500 square feet of office space will suffice and this space should be near the shipping area of the depot (fig. 6).

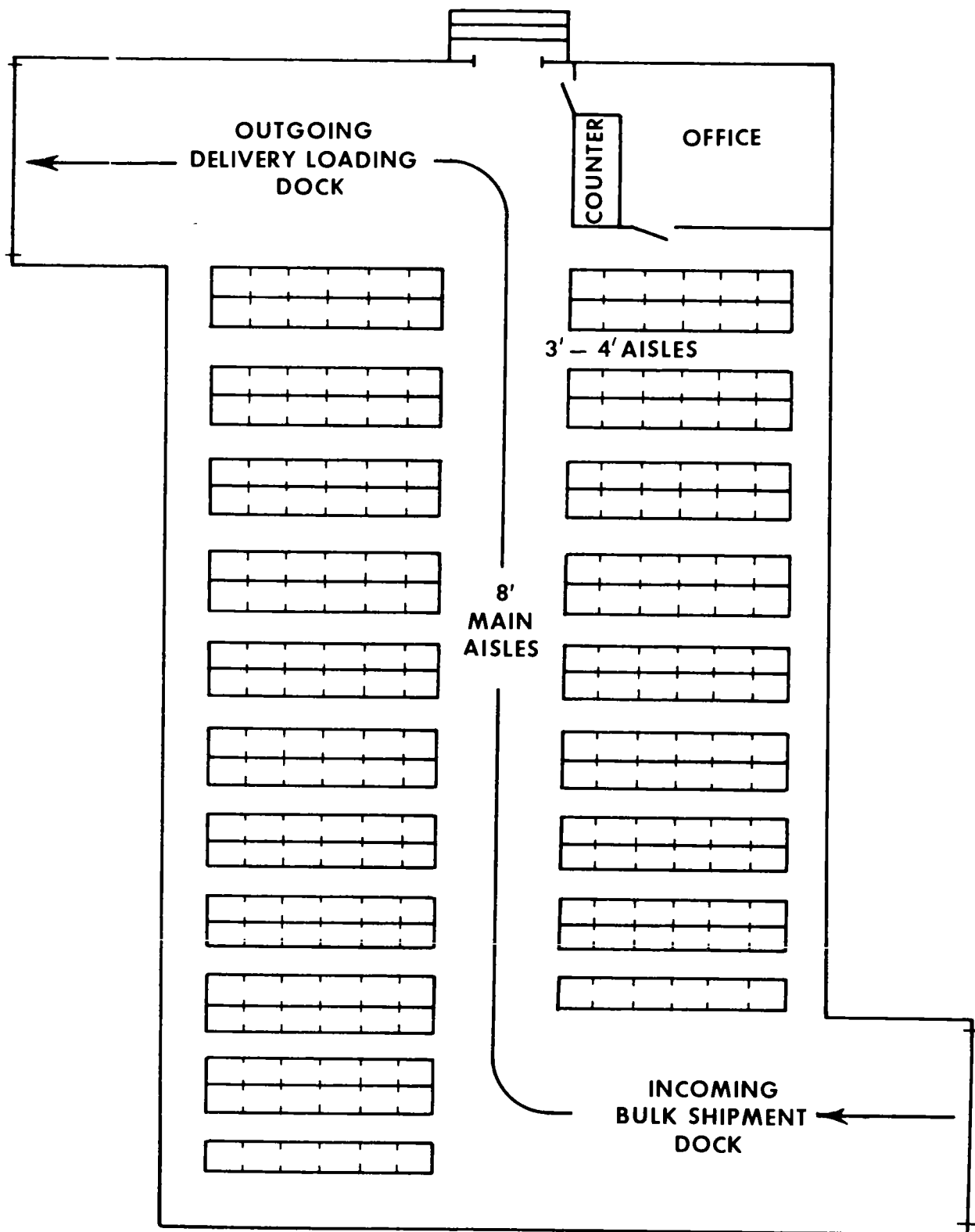


Figure 6. Typical layout of a map depot.

d. Depot operations normally are divided into five functions: receiving, stock control, storage, shipping, and administration. Where the volume of work is large, map depot operations require a well defined and controlled step system under the supervision of experienced personnel to be fully efficient and effective. Personnel assigned to supervisory positions in map depot operations must have administrative and supply qualifications to cope with the varied requirements involved in map distribution and depot control functions.

e. The destruction of maps is an extremely difficult and time consuming operation. While explosives and burning with gasoline accelerate the operation, these methods are not entirely satisfactory and seldom result in complete

destruction. Mechanical shredding or pulping provides the best results, but these methods are more time consuming and require special equipment. To preclude the destruction of other than obsolete map stocks, storage of maps in forward areas should be kept to a minimum and maintained in mobile type storage whenever possible. Responsible personnel must continuously be on the alert to direct rearward movement of map stocks when in danger of capture. When endangered stocks cannot be moved, all possible destruction action should be taken.

f. Like other topographic units, map depots should establish rigid measures to safeguard military information. Paragraph 30 describes the measures to be taken to safeguard military information.

Section II. SPECIAL PROBLEMS

22. Shift Operation

Engineer topographic units are trained and equipped to operate on a 1- or 2-shift per day basis. One-shift operation is normal when training must be included as part of the daily program. Two-shift operation is normal for trained engineer topographic units and when production requirements demand maximum output. Three-shift operation is possible only when the units have been augmented by topographic teams or platoons. Three-shift operation is particularly advantageous when a minimum of space and equipment is available, permitting the maximum number of personnel to be employed with full exploitation of machine potential. Topographic survey units cannot operate by shifts in the normal sense of shift operation. Survey elements, by nature of their work, operate around the clock. Triangulation is usually accomplished at night; traverse, trilateration and leveling during the day. The requirements of projects assigned to survey units determine the working hours.

23. Topographic Supply

The variety, complexity, and specialized nature of topographic equipment and supplies, including the great variety of perishable photographic and lithographic items, makes it es-

sential that supply planning include detailed, periodic checks on unit stocks and close liaison with the depot from which replenishment stocks are obtained.

a. Supply schedules and production, supply, equipment, and status reports form the basis on which the supply officer controls critical items of equipment and supply. Such control requires frequent coordination with both the operations officer and the maintenance officer. These schedules and reports are also used to analyze performance as the basis for estimating future supply requirements.

b. Topographic equipment and supplies require handling by trained personnel. Normal engineer supply troops are not always trained or qualified to identify optical and lithographic equipment; nor to identify, stock, and issue the great variety of perishable photographic and lithographic materials. The depot personnel sometimes need and welcome technical assistance. The commander of the engineer topographic unit should establish close liaison with the commander of the supporting depot and, when requested, provide technically qualified personnel for short periods of time to assist in training personnel of the depot in the recognition and storage of topographic supplies and the repair of topographic equipment.

24. Topographic Maintenance

Engineer topographic equipment and wheel vehicles are a vital factor in the operational capabilities of engineer topographic units. All engineer topographic units, except teams, have sufficient personnel and equipment to perform organizational maintenance on wheel vehicles. Reproduction equipment repairmen and instrument repairmen are provided in all engineer topographic units, except teams, to perform organizational and partial field maintenance on engineer topographic and reproduction equipment.

25. Supply Economy

Supply economy is a command function. Topographic supplies and finished maps must be carefully controlled to prevent waste. A positive conservation program, carefully supervised, will preclude the need for maintaining excessive reserves which overtax production and storage capacities. Careful planning of programs and requirements, proper maintenance of equipment, and efficient use of labor and transportation, enforced by frequent command and staff inspections, will insure effective economy of supplies.

26. Water Supply

An adequate supply of water is an operational necessity for battalion operations and photomapping companies. The reproduction company particularly must be provided with a constant flow of water that is free from visible and organic impurities, such as algae, and have a means for the disposal of waste water. The water supply set issued the topographic unit is intended to produce water for operational purposes, not for drinking purposes. The water produced, therefore, must be operationally satisfactory but need not be potable. The equipment provides a 2,000-gallon storage capacity and a maximum pumping capacity, when filtering, of 6,000 gallons for each 10 hours of operation.

27. Power

Electric power is normally provided by organic generators for field operations. The loss of any of the authorized generators will im-

pede operation and may render the unit incapable of accomplishing its mission. For any unit in a static situation, power should be provided or augmented by local sources, whenever possible.

28. Housing

Wherever possible, weatherproof work areas should be provided for the protection of precision equipment and to enable the technicians to perform their duties more efficiently. This is particularly true of photomapping, reproduction, and map distribution units. School buildings make excellent facilities for photomapping operations. Warehouses, large garages, or factory buildings can be adapted to house van-equipped units. The entire building may be blacked out. Use of a building improves efficiency, since supplies and products may be moved freely from site to site protected from the weather. Handling of supplies is decreased, and storage facilities may be made more accessible.

29. Climate

Engineer topographic units will be required to operate in climates of extreme heat, cold, humidity, and rainfall. These climatic conditions require remedial action.

a. Mapping operations under jungle conditions create problems. Dense jungle growth and swamps limit mobility and visibility. Operations are marked by difficulty in land movement, torrential rains, flash floods, rapid variations in river stages, and tropical storms.

- (1) Heat and humidity increase maintenance problems and affect operations adversely. Metals, wood, cloth, and leather all deteriorate rapidly and require constant attention. Extraordinary care must be taken of press plates to prevent scumming and oxidation which may make the employment of special processes necessary. High humidity introduces excessive dimensional changes in papers, films, and plastics used in compilation, photography, and printing, and procedures must be adjusted to suit these conditions. Photographic proc-

essing is affected by the effects on emulsions and formulas. Particular care must be exercised in laboratory work, and formulas and mixing techniques are adjusted to compensate for the influences of temperature and moisture on chemical reactions. Tropical conditions may require that measures be taken in the treatment and use of water.

- (2) The dense vegetation, deep mud, and absence of roads in the jungle increase the difficulty of field survey operations. Air support by helicopters and fixed wing craft may be required for successful operations.
- (3) For more complete information about jungle operations see FM's 5-1, 31-30, and 100-5.

b. Desert operations are characterized by excessive heat and sand, scarcity of water, and lack of natural concealment. However, except in deep sandy areas, the normal wheel vehicles have unrestricted mobility for both on and off-road movements. Maintenance planning should include provisions for special equipment such as auxiliary cooling systems and heavy duty air cleaners, as well as increased repair parts needed to overcome heat and sand action. Because of dust and sandstorms, bivouac and working areas should be carefully selected for the reproduction and photomapping units. Because of the scarcity of water during desert operations, all water supply sections should be augmented by additional personnel and equipment. This is particularly important for reproduction equipment which must be provided a constant supply of water. In addition, excessive drying of inks, misregistration of printed images, and the instability of cartographic film emulsion should be guarded against. Ink and sensitizer formulas should be adjusted and paper pre-conditioned for registration. For more complete information about desert operations see FM's 5-1, 31-25, and 100-5.

c. For operations in extreme cold, arrangements should be made for continued heating of the van interiors both during the opera-

tions and while inactive to prevent freezing of water and solutions and to maintain the press and other units at operating temperatures. Such arrangements will avoid costly delays, prevent corrosion, and permit normal operating procedures.

- (1) The maintenance and repair of topographic and reproduction equipment become more difficult in extremely cold climates. Pumps, tanks, and circulating systems for mobile reproduction units should be completely drained when vans are inactive and unheated. Additional repair parts should be provided for equipment sensitive to cold weather operations.
- (2) Field operations, particularly surveying, at temperatures ranging from 10° and lower, become increasingly difficult. Men are subject to the health hazards of frostbite, freezing, and exhaustion. The resulting loss in efficiency both in personnel and surveying capacity will require additional manpower to be assigned to survey units. Snow and ice will limit visibility, and lack of roads make it difficult for field parties to operate normally. Men should be provided special cold weather clothing, high caloric rations, and arctic-type housing. Air transport for both reconnaissance and surveying operations becomes exceptionally important.
- (3) For more complete information about cold weather operations see FM's 5-1, 31,70, 31-71, and 100-5.

30. Safeguarding Military Information

a. Mapping operations precede much of the planning for future military operations. The security officer is charged with the responsibility for establishing rigid measures to safeguard military information during the planning stages and throughout mapping operations.

b. Strategic areas, selected in advance of military operations, should be reserved from general knowledge, and all correspondence, as-

signment of mapping priorities, and collection of compilation material should be classified as highly as the situation dictates.

c. During classified military operations that warrant a coding system for the distribution of maps, the security officer, in coordination with the operations and map distribution officers, may recommend to the battalion commander that—

- (1) Map reproduction and distribution centers be placed under armed guard.
- (2) Personnel be screened before assignment to reproduction and distribution activities.
- (3) Working groups be quarantined during critical periods.
- (4) Double check systems be prescribed for counting and coding of map shipments, and destruction of waste stocks.
- (5) Special pass system be established to control entrance of personnel into critical working and distribution areas.
- (6) Company and unit commanders and all members of the battalion staff, by personal inspection, insure that security measures are being rigidly enforced.

31. Tactical Operations

a. Corps, army, and theater headquarters, near which engineer topographic units usually are bivouacked are important enemy targets subject to sabotage and subversive action from within; liable to ground attack, including partisan or guerrilla action; to aerial bombing and strafing; to airborne assault; and to chemical and atomic or radiological attacks.

b. While other troops are responsible for the security and local defense of the headquarters area in which engineer topographic units may be bivouacked, the engineer topographic unit commander is at all times responsible for the security and defense of his command.

c. The operations section of engineer topo-

graphic units in coordination with the other staff sections prepares an operation plan covering defense against all possible types of attack. To be effective, the plan should be developed simply and not cluttered with too much detail. The principles stated in FM 7-10, FM 7-20, and FM-135 are the essential elements of such a plan.

32. Counterinsurgency

Counterinsurgency includes all military, political, economic, psychological, and sociological activities directed towards preventing and suppressing resistance groups whose actions range in degree of violence and scope from subversive political activity to violent actions by guerrilla elements to overthrow a duly established government. The basic military problem is to maintain or restore internal security so that the counterinsurgency program can operate. Comprehensive, national counterinsurgency plans are required to integrate and coordinate the use of all military and non-military means, including available outside assistance, to suppress and eliminate all forms of insurgency. Counterinsurgency is the time to start beating the enemy at his own game—the winning of men's minds, emotions, and loyalty to the concept of freedom; promoting justice, individual rights, equality of opportunity, and a higher standard of living.

33. Engineer Topographic Units in Counterinsurgency

During a counterinsurgency campaign, engineer topographic units can play an important role in the successful conclusion of a counterinsurgency program in—

a. *Providing Maps.* Counterinsurgency operations commonly take place in remote and sparsely inhabited areas where maps may or may not be available. Typical small-unit operations require more detailed knowledge of the terrain than normal operations. Where map stocks are available, topographic units can print and distribute them as needed and can provide aerial photo mosaics at large scale to provide more detailed information. Where no maps are available, mosaics become even more important as a quickly available substi-

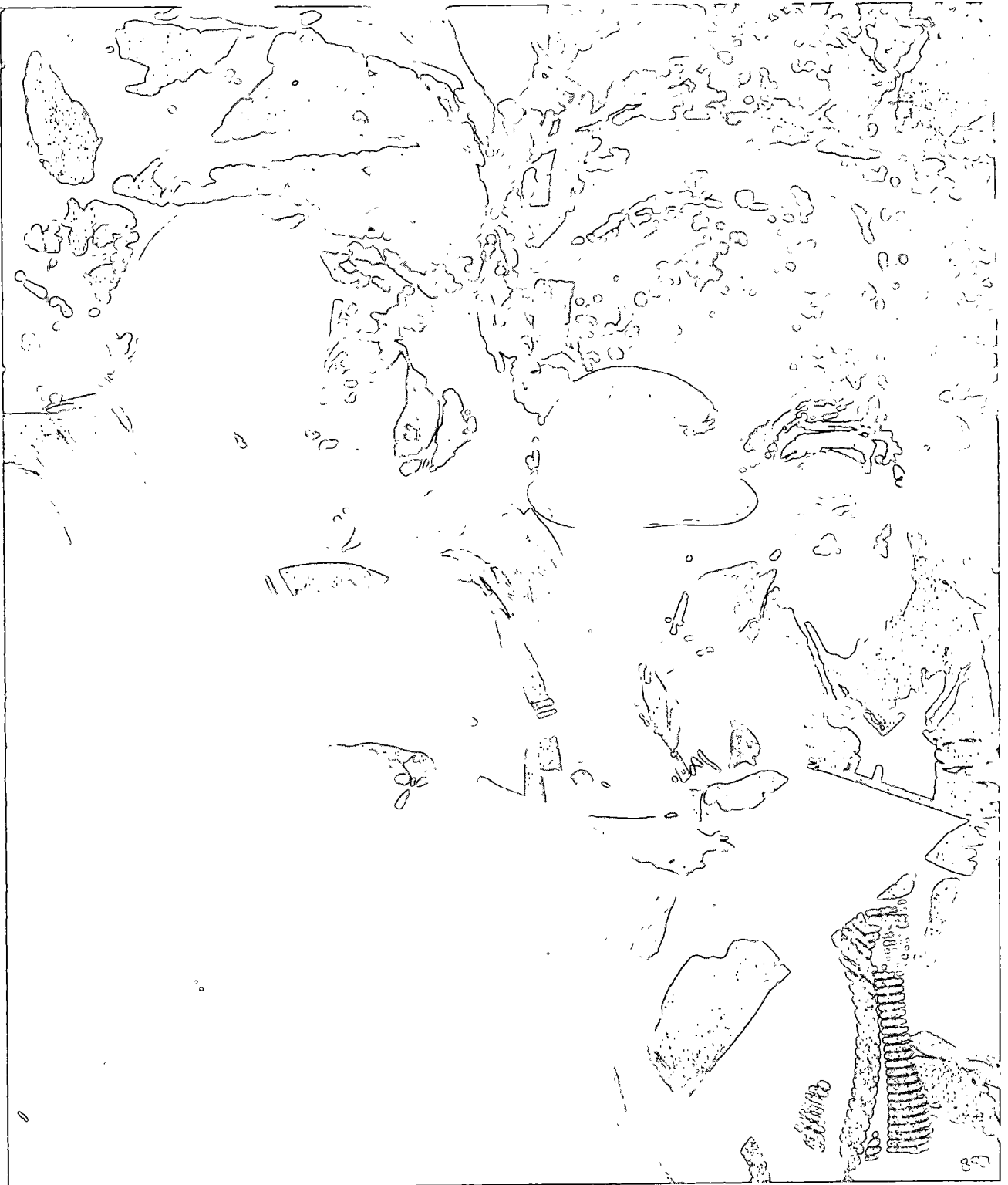


Figure 7. Obtaining information from a political boss for maps for counterinsurgency.

tute, while the topographic units carry out the more time-consuming task of compiling standard maps.

b. Terrain Intelligence. Terrain intelligence products for counterinsurgency are aimed at the needs of foot troops, light vehicles, and air-supported operations. Information on cover and concealment is valuable as well as suitable for helicopter operations. Package studies to cover small operational areas have been developed and can be prepared by engineer intelligence units in the field. Soil conditions and availability of construction materials are sub-

jects of special studies to aid in construction (fig. 7).

c. Geodetic Survey Work. Geodetic surveys are carried out in conjunction with the survey agencies of countries involved in counterinsurgency for map making and civic welfare project purposes. Surveyors from the topographic units work closely with native teams in establishing the accurate positions and elevations required. Wide dispersion of points often makes it necessary to enter guerrilla-controlled areas to make survey operations (fig. 8).



Figure 8. Topo survey team establishing an elevation for a native chief's village irrigation project.

CHAPTER 4

ENGINEER TOPOGRAPHIC ORGANIZATION

34. Missions

The missions prescribed for engineer topographic units are reflected in applicable tables of organization and equipment.

a. The primary objective of an engineer topographic unit is to provide adequate maps, survey control, and related services in sufficient time and quantity to elements of the corps, army, army group, or theater to which it is assigned in time for planning and use in tactical operations.

b. A continuing objective is to improve map and survey coverage as time permits.

c. Generally, the mission of engineer topographic units is to support the operations of the headquarters to which assigned. See paragraph 38 for a detailed statement of the topographic services performed by engineer topographic units.

35. Topographic Support in a Theater of Operations

a. *The engineer topographic company, corps, and the engineer topographic battalion, army, provide capabilities for surveying, map compiling, map reproduction, and map distribution, all of which are normal requirements of the corps or army headquarters to which they are assigned. A mapping program involving all four of these functions may be classified as a balanced program. The capabilities of these units for compiling new maps is very limited.*

b. The engineer base topographic battalion, because of its more flexible organization, is more adaptable to unbalanced mapping programs in which expenditure of effort is required to be concentrated on one or more phases of map production. For example, where the mapping program requires only surveying, the base topographic battalion may be activated with a headquarters and headquarters detachment, several engineer base survey companies,

but minus any photomapping, indigenous augmentation reproduction, or distribution companies. The battalion reinforces and rounds out the corps and army topographic efforts into a coordinated mapping and charting program to meet normal theater requirements. It provides a means for accomplishing long-range mapping projects for a theater of operations.

36. Assignment

The normal assignment of any topographic unit is determined by mapping requirements and the availability of engineer topographic units. However, the assignment is closely related to the mission prescribed in tables of organization and equipment applicable to the various units. The engineer topographic company, corps, is normally assigned to a corps; the engineer topographic battalion, army, to a type field army, or army group; the engineer base topographic battalion to an army in the zone of interior or to a theater headquarters in a theater of operations. As the mapping situation changes, topographic units may be assigned to headquarters higher or lower than that to which normally assigned.

37. Employment

The extent of the employment of a topographic unit is governed by personnel and equipment. For example, the engineer topographic company, corps, is neither organized nor equipped to perform extensive original map compilations. The company, therefore, can be employed in a situation requiring original map compilations only if its personnel and equipment are augmented. Engineer topographic units are prohibited by regulations to supplement the production of field printing plants in the production of posters, programs, administrative publications, and such nonmapping projects which interfere with the mapping mission of the command. Production of these items is the responsibility of The Adjutant General (AR 310-1). In accordance with AR

117-5, the theater commander is responsible for the accomplishment of photographic and mapping work directed by the Department of the Army, or required by the theater. Within the broad scope of this regulation, the employment of the mapping capabilities of any topographic unit for other than mapping purposes is not authorized.

38. Capabilities

Some of the general capabilities of engineer topographic units, corps, army, and base in a theater of operations are to—

a. Provide staff planning and supervision of mapping operations of attached or assigned topographic troops for base and army battalion only.

b. Provide administrative, supply, maintenance, operational and tactical control of organic or attached troops.

c. Recover, extend, and establish new horizontal and vertical ground survey control, including geodetic control for the use of the field artillery.

d. Prepare and revise maps, photomaps, sketches, drawings, and related material, including new maps from aerial photography using stereophotogrammetric instruments.

e. Prepare controlled or uncontrolled color intensified mosaics of aerial photographs.

f. Reproduce in quantity maps, overlays, and related material, as required, in black and white or multicolor.

g. Store and distribute maps and similar material required by corps, army, and theater of operations troops.

h. Prepare, reproduce and distribute engineer intelligence reports.

i. Operate survey information center to collect, coordinate, and disseminate survey information for use of engineer topographic units, and supported elements and disseminate survey information for the use of engineer topographic units, artillery units and other supported elements.

j. Provide supplementary survey personnel for forward engineer topographic units of base and army battalion only.

k. Operate seized civilian mapping agencies and lithographic printing plants, engineer topographic corps excepted.

l. Meet normal map requirements of a major theater of operations or of any army group of three armies, engineer topographic corps excepted.

39. Mobility

a. The engineer topographic company, corps, less its survey platoon, is mobile to the extent that it can transport its organic personnel and equipment with organic vehicles, but requires additional transportation for an overland movement, map depot stocks excluded. The company is 85 percent mobile.

b. The engineer topographic battalion, army, is mobile to the extent that it can move by echelon, but requires additional transportation to transport paper stocks, map depot stocks excepted. The battalion is 85 percent mobile.

c. The engineer base topographic battalion, less its survey company, is not mobile, due to its assigned mission and organic equipment. It is not intended that these units be capable of moving by means of their organic vehicles. Once established, the photomapping and reproduction companies of this battalion can be moved only with interruption of operations for long periods of time. Additional transportation must be furnished for the move.

CHAPTER 5

Section 1. ORGANIZATION

40. Composition

a. Engineer topographic company, corps, consists of a company headquarters, (with an operations section and a map distribution section) survey platoon, cartographic platoon, reproduction platoon and an aviation section (fig. 9).

corps.

b. The company will be employed as the corps commander directs, and operates under the operational control of the corps engineer and general staff supervision of the corps G2. The primary function of the company is to provide map and survey information in support

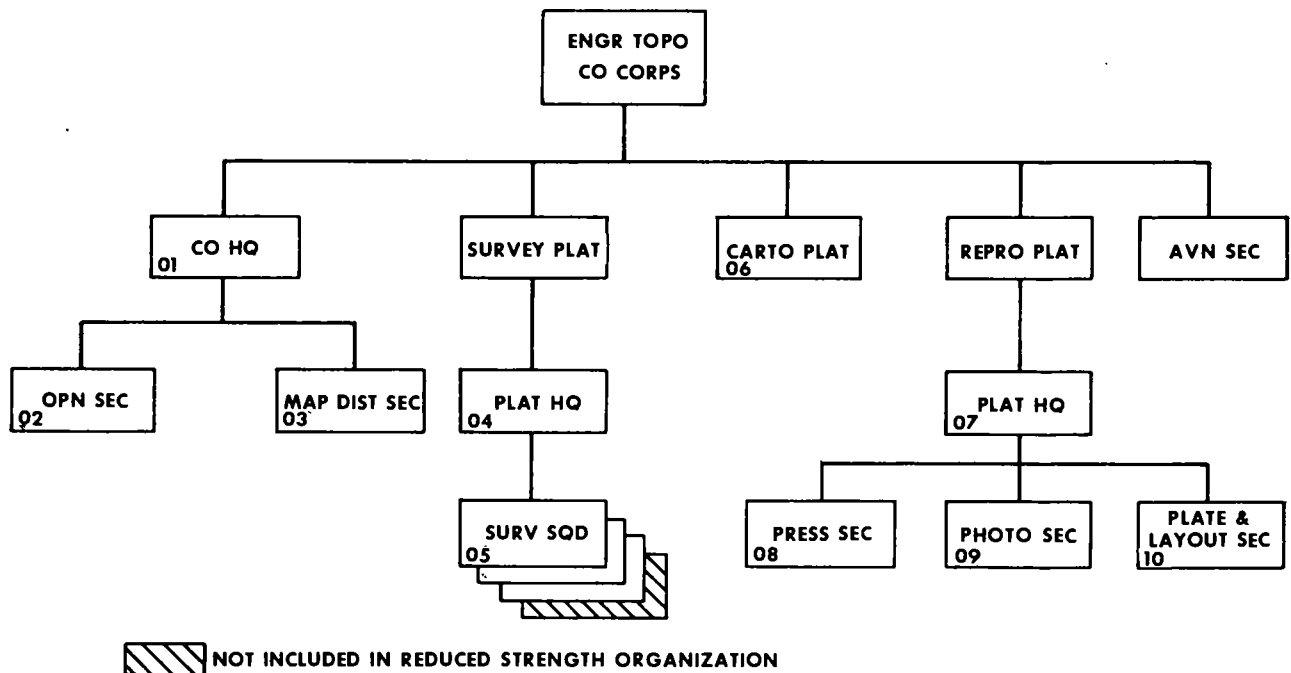


Figure 9. Engineer topographic company, corps.

b. The company is equipped with van-type trucks that house major items of photomapping and reproduction equipment and provide a limited amount of inclosed working space. The bodies of these vans are weatherproof and insulated against extremes of temperature, and are equipped with facilities for maintaining practical working temperatures.

41. Relation to Corps Command

a. One engineer topographic company, corps, normally is assigned to each army

of corps operations. The company is normally bivouacked close to corps headquarters and maintains direct channels to the corps engineer and his staff.

42. Relation to Other Topographic Units

a. The engineer topographic commander advises the corps engineer and his staff on all matters pertaining to maps and charts. He assists the corps engineer in determining the mapping needs of corps units. The company

commander coordinates with the corps artillery survey officer the survey requirements of the artillery in connection with fire control.

b. When not employed on its primary functions of providing survey control and of producing maps for use by the corps, the company assists base and army topographic battalions in the development of theater mapping programs.

43. Mission

a. The engineer topographic company, corps,

is designed and organized for the purpose of compiling, revising, reproducing, and distributing maps, and for extending and establishing ground control in the field, as required by one corps. Map compilation is limited to provisional maps, mosaic construction to semi-controlled mosaics, controlled mosaics and survey control to second or lower order accuracy.

b. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations against hostile ground attack.

Section II. COMPANY OPERATIONS, GENERAL

44. Company Headquarters

a. The company headquarters consists of an operations section and a map distribution section.

b. Company headquarters provides the necessary messing facilities, administration, supply organizational maintenance for organic vehicles and third echelon maintenance for organic topographic equipment.

45. Operations Section

This section under supervision of the executive officer, who is also operations officer, provides the personnel and facilities to assist the company commander plan the technical operations of the company in accomplishing assigned missions, projects, and training functions. This section is responsible for coordinating all technical details between the various elements of the unit. It will receive, control, and coordinate all topographic missions and projects assigned.

46. Map Distribution Section

This section operates the corps map depot which stocks maps and related topographic material for supply point distribution to corps elements.

47. Administrative Operations

a. The company is equipped to function as a separate unit, and is administratively self-

sustaining. In this respect, the engineer topographic company, corps, differs from the companies of the topographic battalion which require administrative support from battalion headquarters.

b. Corps signal units provide communications from the corps headquarters to the company headquarters, engineer topographic company. Company headquarters installs and operates telephone switching facilities and provides telephone and messenger service to the platoons. The company headquarters is also provided FM voice and AM (voice-CW) radios for operation in the company command net.

c. The platoon sergeants, while responsible to their platoon leaders for the administration and discipline of their platoons, are primarily technical supervisors. During map production operations, they have little time to devote to administrative matters. For this reason, one of the most important functions of the first sergeant is to devise ways and means to relieve the platoon sergeants of as much of the administrative load as possible. The first sergeant keeps in close contact with the platoon sergeants, informing them of current administrative and personnel matters that affect their platoons, and obtaining administrative and personnel information by personal visits rather than by means of platoon reports.

Section III. TECHNICAL OPERATIONS

48. General

a. Technical operations of the company include all the necessary operations to produce maps and related matter for use by the corps in its area of responsibility. Organically, this includes the capabilities to—

- (1) Plan and conduct ground surveys of second and third order accuracy.
- (2) Extend existing survey control into each division rear area and each missile site located within the corps rear area. Two third order survey control points (position, elevation and azimuth to another point) must be furnished each division within six hours of establishment of a new divisional area. One third order survey control point must be furnished to within 1,000 meters of each missile site in the corps rear area. This point is to be furnished within 8 hours of establishment of selection of the site.
- (3) Revise existing maps, compile provisional maps, and prepare for reproduction photomaps, sketches, overlays, drawings, and other items of engineer intelligence.
- (4) Construct semicontrolled and controlled mosaics.
- (5) Reproduce maps, sketches, drawings, photomaps, overlays, and other items of engineer intelligence.
- (6) Print sheets of the size that its organic presses can handle.
- (7) Produce negatives not larger than the vacuum-back of its organic copy camera.
- (8) Overprint existing maps.
- (9) Procure stocks and inventory maps.
- (10) Maintain minimum map stock levels as prescribed by the corps commander.
- (11) Operate the corps map depot which stocks maps and makes supply point

distribution to corps units and to the division support command for further distribution within the divisions.

b. The equipment of the company is limited by the necessity for mobility which requires van-mounted reproduction and photomapping equipment.

- (1) Company headquarters, in addition to its normal housekeeping equipment, has tool sets provided for organizational maintenance and water supply equipment for press and photographic processes.
- (2) The survey platoon has equipment for plane table work, leveling by instrument and barometric methods, and 1.0 and 0.2 second theodolites for traverse and triangulation, and distance measurement by electronic means. An electric digital computer is provided for computation and adjustment of survey field data.
- (3) The cartographic platoon has six van-type trucks containing copy and supply equipment, photomapping section, cartographic section, multiplex section, map revision section, and rectifier section.
- (4) The reproduction platoon has six van-type trucks containing two offset lithographic presses, a copy camera, photographic processing equipment, plate processing equipment and processing equipment. All equipment is electrically operated. Figures 10, 11, and 12 illustrate the interior arrangements of the van-type trucks of the mobile press unit, the mobile process camera unit, and the mobile plate processing unit. Figure 13 shows a cartographic van fully expanded. Figures 14 and 15 show field and garrison map reproduction train possible layouts.

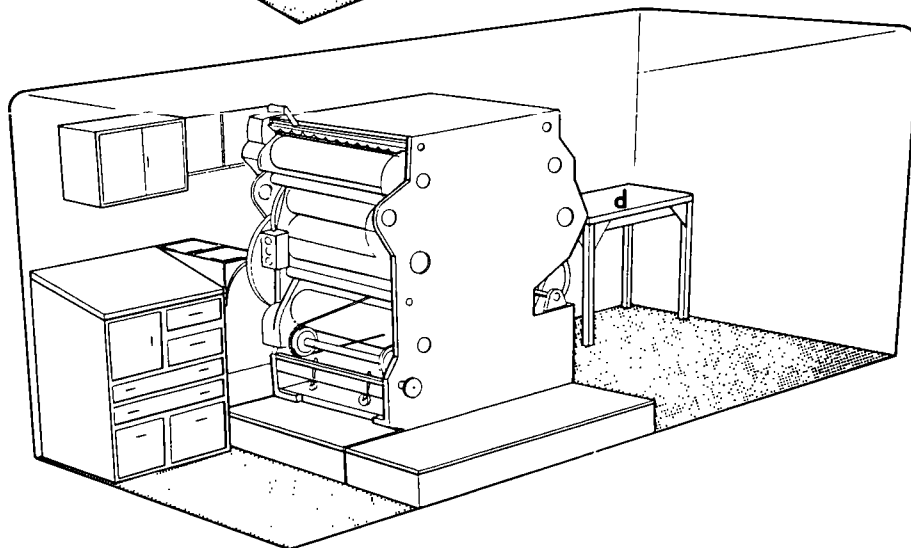
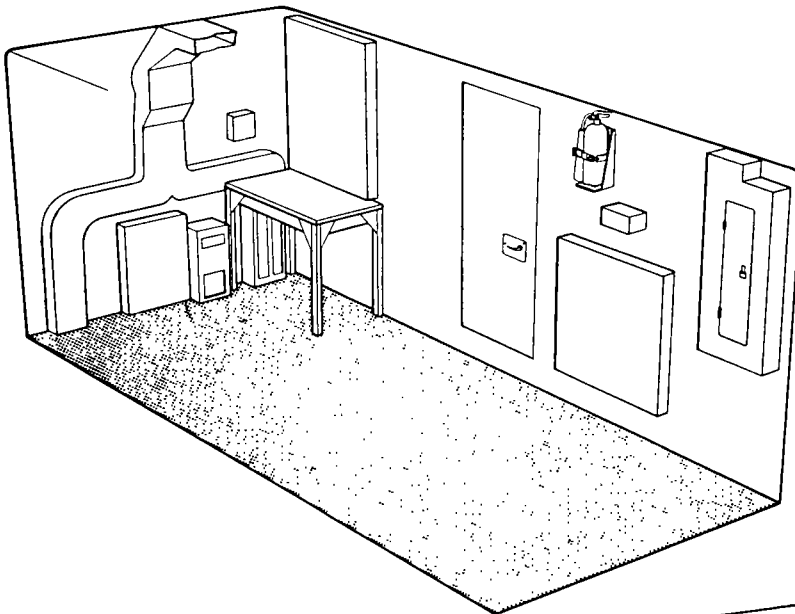
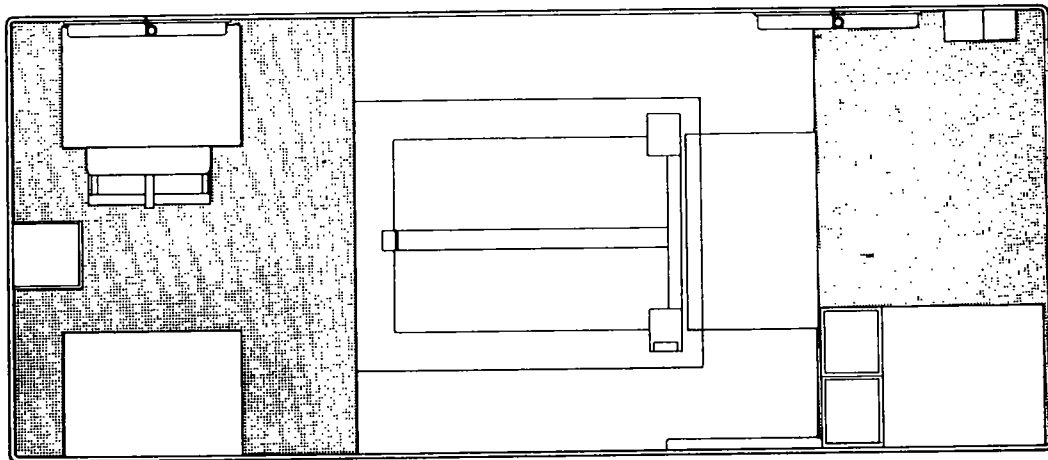


Figure 10. Interior arrangement of mobile press van.

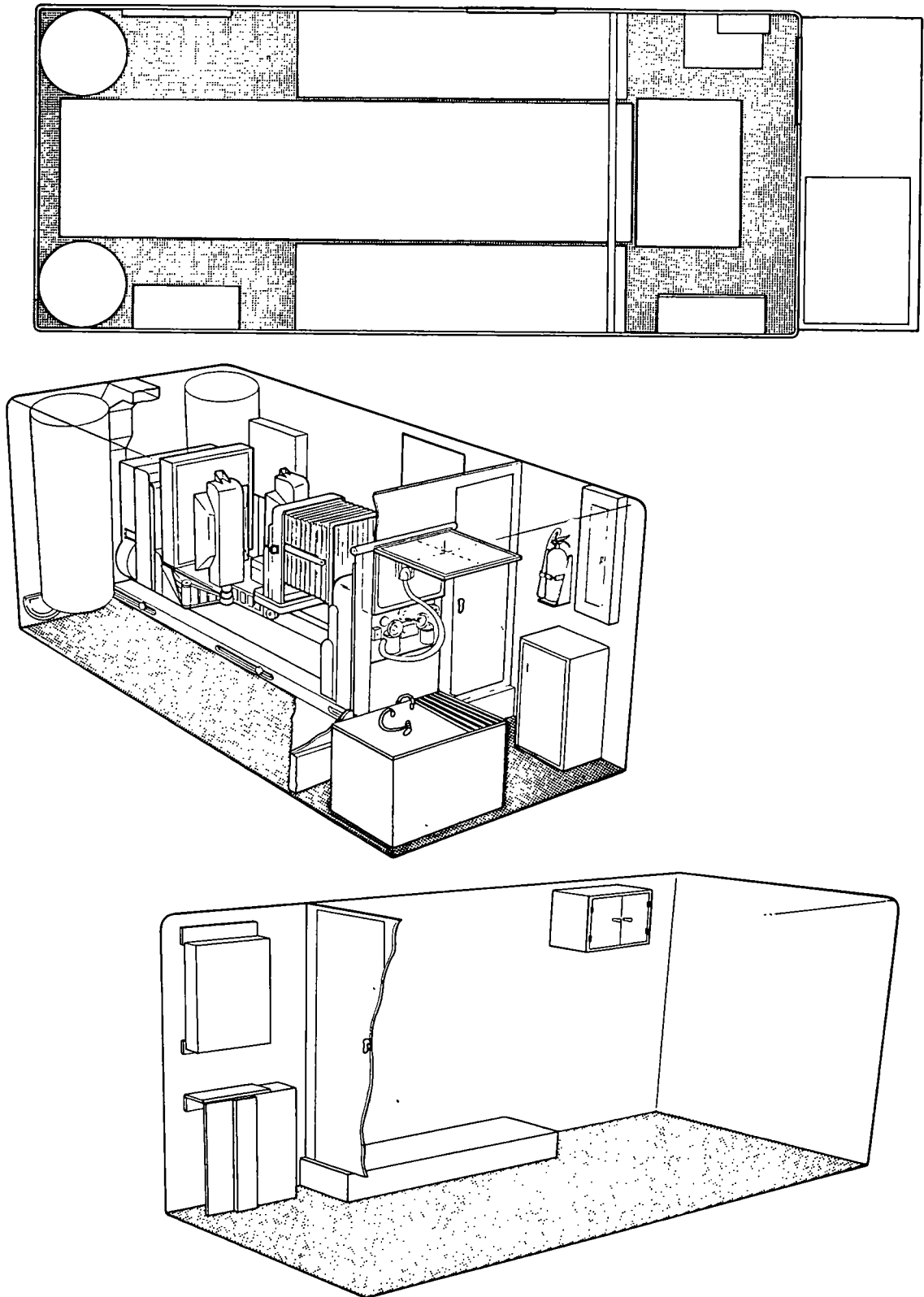


Figure 11. Interior arrangement of mobile process camera van.

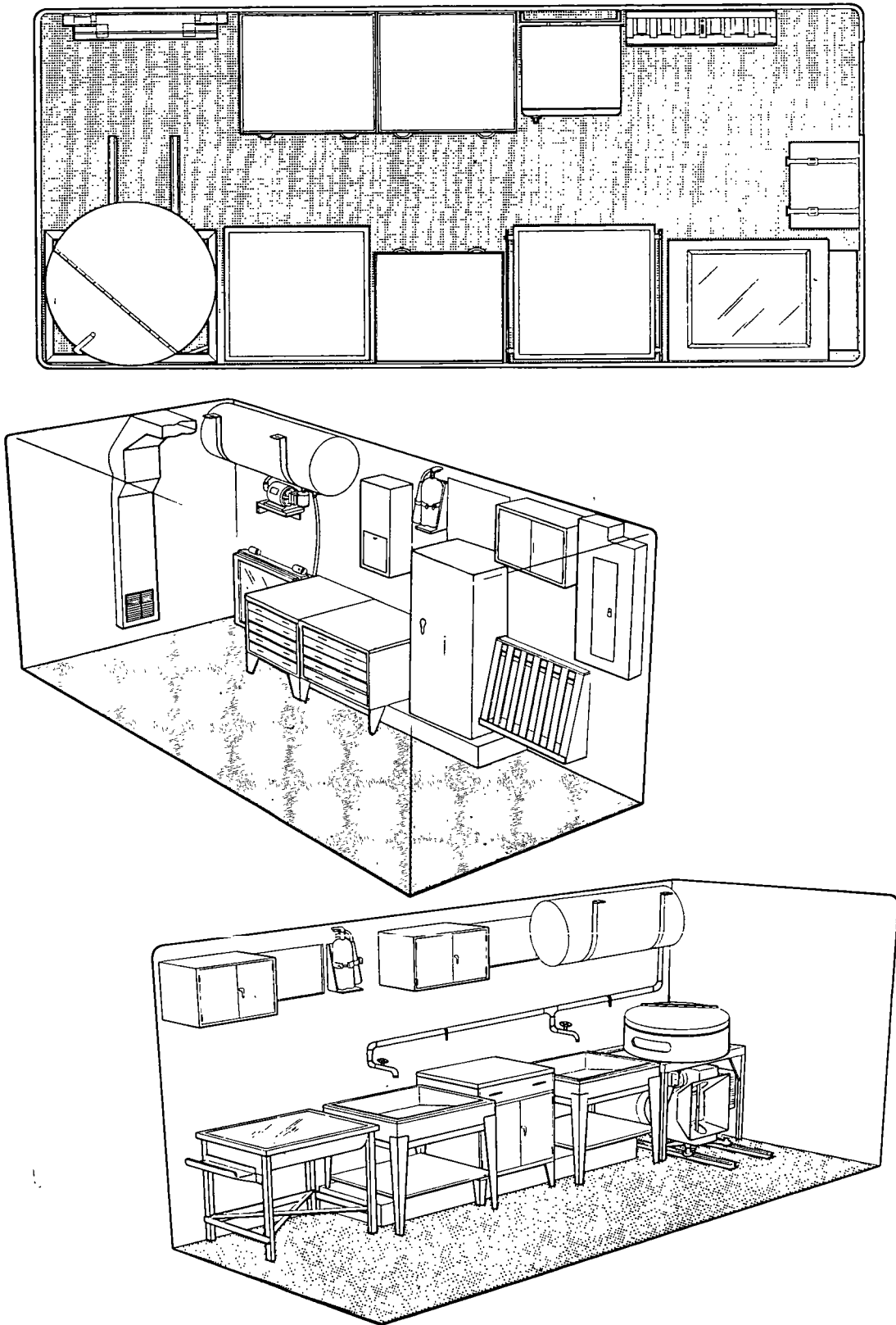


Figure 12. Interior arrangement of the mobile plate processing van.

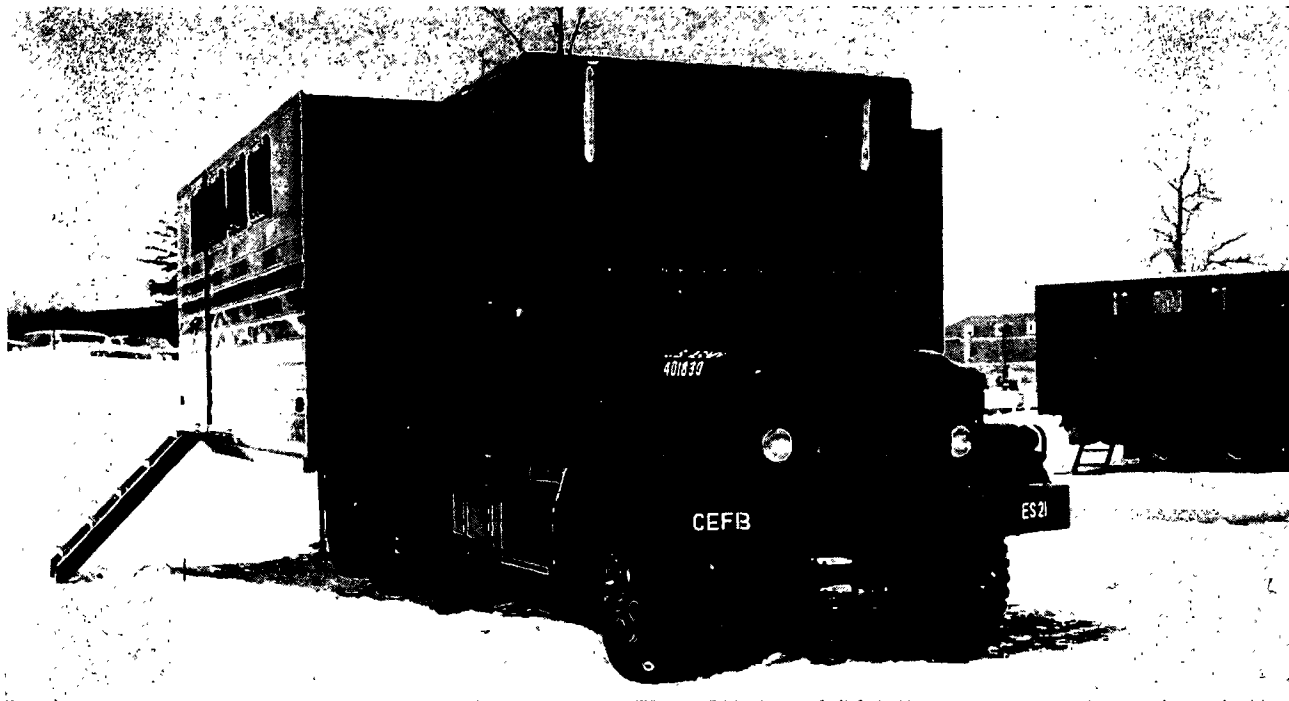


Figure 13. Cartographic van fully expanded.

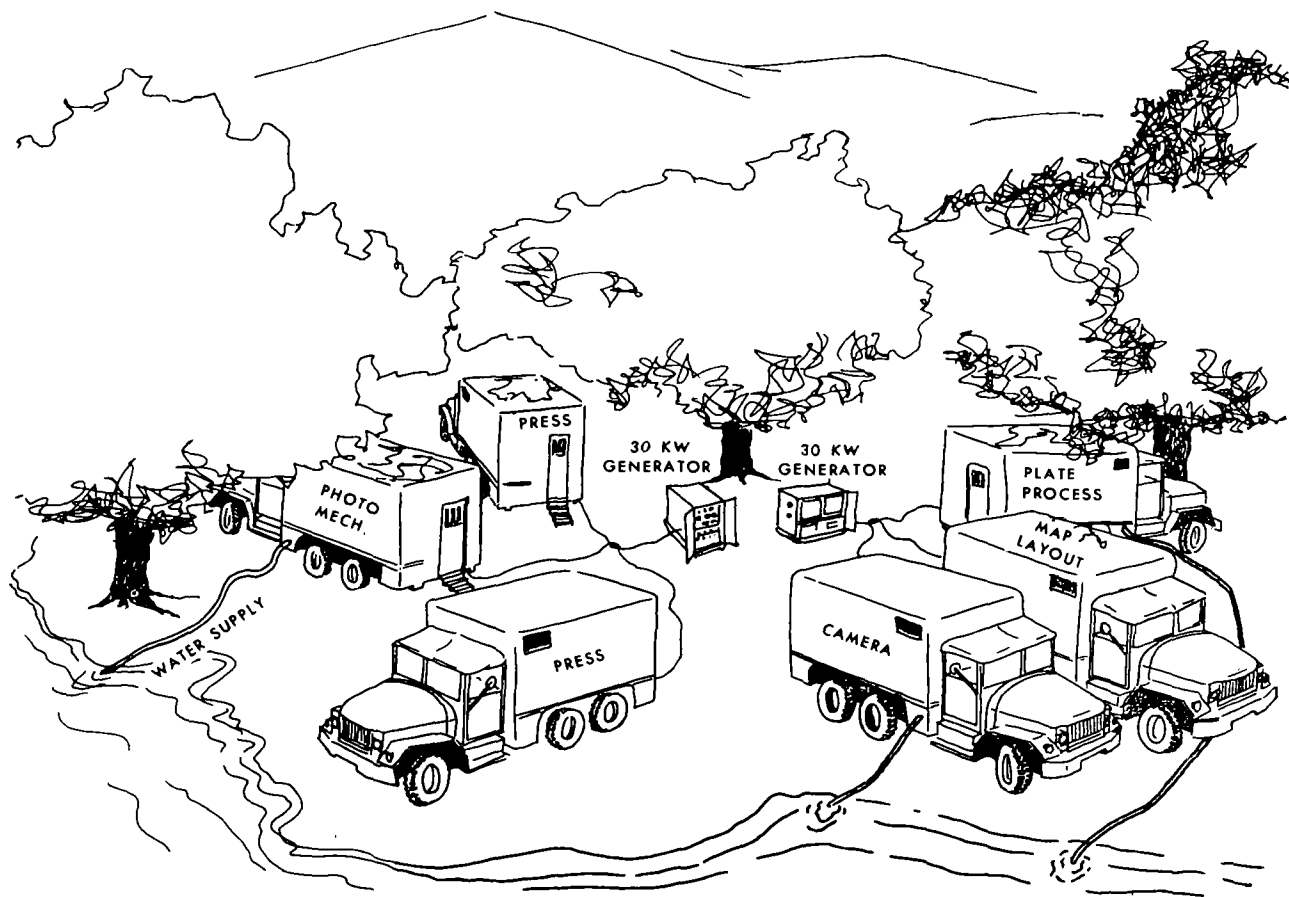


Figure 14. Possible layout of map reproduction train.

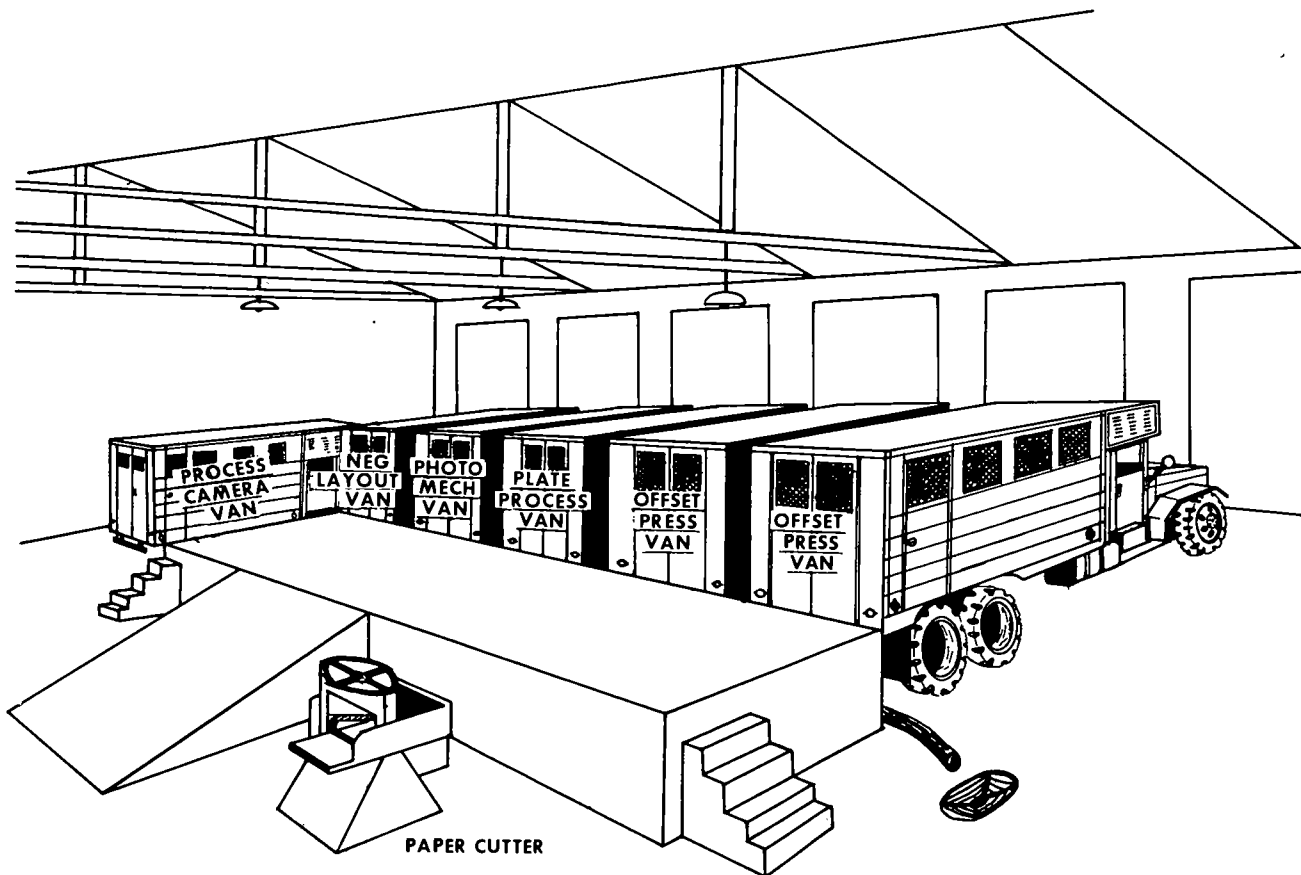


Figure 15. Possible garrison layout of map reproduction train.

- (5) Complete lists of equipment will be found in the unit's current TOE. Component parts of sets are listed in appropriate engineer supply manuals.

49. Survey Platoon

a. The survey platoon performs topographic surveys as required for topographic mapping and establishes ground control for missile support surveillance devices and conventional artillery. The platoon is organized with a platoon headquarters and four survey squads (three squads at reduced strength).

b. Personnel comprising platoon headquarters are composed of the platoon leader, survey technician (warrant officer) assisted by a survey supervisor, a chief topographic computer, topographic computer, and radio operator.

c. Each of the four survey squads are composed of a section chief, topographic sur-

veyors, a topographic computer, survey recorders, and rodman-tapeman. These squads are capable of being subdivided into smaller survey field parties, usually of three men each, for the accomplishment of specified survey missions. These four survey squads furnish ground control to corps artillery and other organizations on a first priority basis when the situation is a "moving" one. During periods when the situations are "static," these same squads improve their survey data, conduct engineer and topographic surveys, as required. The survey squads are authorized FM voice radio sets to maintain radio communications with platoon headquarters when the squads are employed away from the company area.

50. Cartographic Platoon

The cartographic platoon performs the cartographic drafting required in the preparation of expedient maps and limited revisions to existing maps, preparation and compilation of

the map manuscript for color separation, prepares color separation materials for lithographic reproductions, and accomplishes multiplex control extension using specialized application of photogrammetry. The warrant officer is assisted by a platoon sergeant who maintains production control, schedules of priorities, etc. The platoon, as depicted, does not provide a platoon headquarters nor a section organization. However, to provide for scheduling and phase production, the platoon is usually organized into a platoon headquarters, a compilations section, and a drafting section at the discretion of the unit commander.

51. Reproduction Platoon

a. The reproduction platoon reproduces maps and photomaps in single or multicolor and overprints in one or more colors on existing maps, using photolithographic and lithographic methods.

b. The platoon consists of a platoon headquarters, a photographic section, a plate and layout section, and a press section.

52. Aviation Section

The aviation section provides necessary transportation essential to the mission of the unit; it is primarily used in the management, rapid deployment and resupply of the four survey squads. However, the aircraft may be utilized for reconnaissance and transportation of other personnel and equipment as required. Increased dispersion under present concepts have greatly extended the areas of responsibility of the topographic company corps. Officers assigned to this section should be trained in topographic procedures. This section is under the direct supervision of a rotary wing aviator and includes two utility helicopter pilots and the necessary aircraft maintenance personnel. In addition, an aviation electronic equipment repairman is provided to perform organizational maintenance on organic avionics gear.

Section IV. TACTICAL OPERATIONS

53. General

The engineer topographic company, corps, is responsible for its own local security and should be prepared to fight in self-defense. The company being normally located close to corps headquarters usually becomes a part of the defense plan for the headquarters area.

54. Armament

Armament of the company consists of individual weapons, rocket launchers, and light-weight general purpose machineguns.

55. Reorganization for Combat

The purpose of reorganizing the company for combat is to prepare the company for defense of its bivouac and working area, or, if called upon by the corps commander, to fight as infantry. The company should be divided into two echelons—combat or forward echelon, and security or rear echelon. A typical reorganization is as follows:

a. The combat echelon consists of—

- (1) Company headquarters composed of the company commander, executive officer, first sergeant, operations sergeant, supply sergeant, two messengers, and a weapons section composed of three 7.62 MG crews, one each from the administrative section, the photomapping platoon, and the reproduction platoon. The weapons section provides company headquarters firepower for the support of the rifle platoons, and the defense of company headquarters and bivouac and working area.
- (2) Three rifle platoons of three rifle squads each, utilizing the survey, photomapping, and reproduction platoon less two machinegun crews.
- (3) Map distribution section is organized into a rifle section of two rifle squads and either kept in company support or assigned to one of the rifle platoons as the situation requires. If additional

7.62 MG's or rocket launchers are made available, the map distribution section should be organized into weapons sections of two 7.62 MG crews or a section of one 7.62 MG crew and one rocket launcher crew. Personnel of the map distribution section should be trained in the use of these weapons. When the section is so used, it becomes the company headquarters weapons section, thereby releasing one 7.62 MG crew to each of the rifle platoons.

b. The security echelon consists of mess and maintenance personnel from company headquarters who are responsible for local security of bivouac and working areas, fire fighting, damage control, preparation and distribution of hot meals, and the preparation of equipment for evacuation in the event the bivouac and working areas become untenable.

c. Corps provides telephone net to the company command post. Company headquarters provides messenger and phone service to its platoons.

d. Rations and water are furnished elements of the combat echelon by the security echelon. The mess section furnishes hot meals when the situation permits; otherwise, combat type rations are issued. Ammunition supply is controlled by the supply sergeant with transportation and loading personnel furnished by the security echelon. Other supplies as needed by the combat echelon are sent forward from the security echelon area.

e. The corps medical unit which provides medical service to the company provides an

aid man to the company. Litterbearers are drawn from company personnel as required.

f. The reorganization plan usually becomes effective upon receipt of alert from corps headquarters. On alert, all engineer work ceases except water supply and limited supply which should be continued by the security echelon. Engineer equipment is evacuated to equipment park designated by the commander of the security echelon (the map distribution section supervisor). Full field equipment should be retained by individuals. All other individual equipment should be loaded by the security echelon and stored in the security echelon area.

g. The reorganization for combat plan should be used during all company combat training exercises.

h. The engineer topographic company, corps, may adopt the type of reorganization normally followed by the headquarters and service company or the engineer photomapping company of the engineer topographic battalion, army, in preparing a suitable reorganization for combat to fit its particular need. A typical reorganization for combat of the engineer topographic battalion, army, is shown in appendix III. Both combat and normal position titles and assignments are shown in the tabulation.

i. Paragraphs 94 to 98 discuss the defensive measures that should be employed against ground attack, aerial bombing and strafing, chemical or biological, and nuclear or radiological attack. Paragraph 98 discusses the measures to be taken during evacuation.

CHAPTER 6

ENGINEER TOPOGRAPHIC BATTALION, ARMY

Section I. ORGANIZATION

56. Composition

a. The engineer topographic battalion, army, consists of a headquarters and headquarters company, one engineer map reproduction and distribution company, and one engineer photomapping company. The organization of the

b. The battalion receives topographic support from the engineer base topographic battalion. The base battalion furnishes the army battalion basic material, such as trigonometric lists and map reproducibles, and carries horizontal and vertical survey control forward to

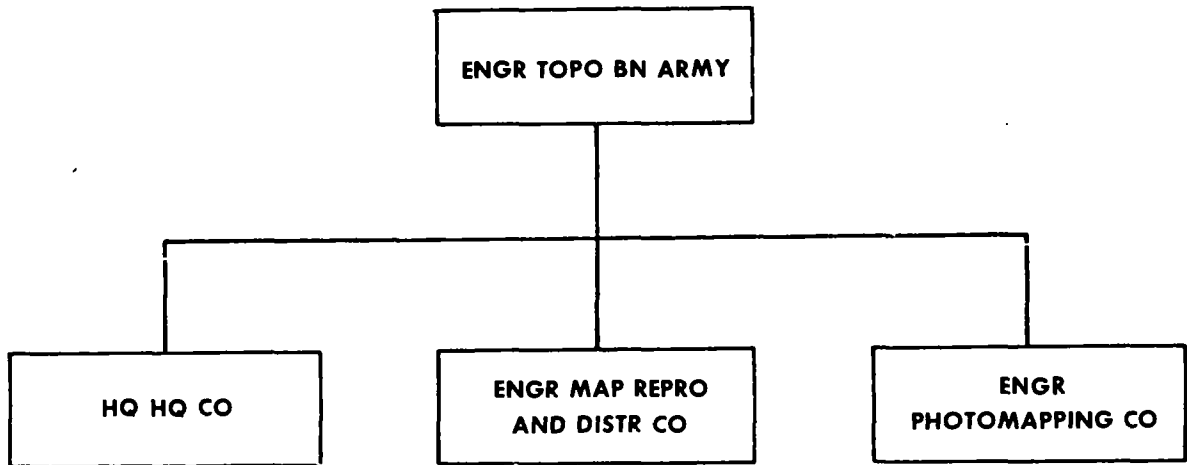


Figure 16. Engineer topographic battalion, army.

engineer topographic battalion is shown in figure 16.

b. The battalion is approximately 85 percent mobile and is equipped with trucks, trailers, van-type trucks, and three utility helicopters.

57. Assignment

a. One engineer topographic battalion, army, is normally assigned to a field army.

b. The battalion performs under the operational control of the army engineer. Battalion headquarters is usually located near army headquarters to provide for close liaison.

58. Relation to Other Topographic Units

a. The battalion commander coordinates the planning and execution of mapping activities with the army engineer and his staff.

the army battalions control point. The army battalion, in turn, furnishes basic mapping material and extends survey control forward for pickup by the corps topographic companies.

c. When not employed on its primary function of producing maps for use by the army, the battalion assists the base topographic battalion in the development of theater mapping programs.

59. Mission

The mission of the engineer topographic battalion, army, is to provide maps and engineer survey information and control as required for an army in the field. Individuals of this unit can fight as infantrymen when required. The unit has capability of defending itself and its installations against hostile ground attack.

- a. Battalion headquarters consists of the battalion commander, the executive officer, the operations officer, adjutant (S1), a map reproduction officer, a supply officer (S4), an engineer intelligence officer (S2), and a sergeant major.

**62. Engineer Photomapping Company,
Army**

a. The engineer photomapping company, army, consists of a company headquarters, and two identical photomapping platoons. The organization of the engineer photomapping company, army, is shown in figure 18.

b. The company is approximately 75 percent mobile with all its technical operations

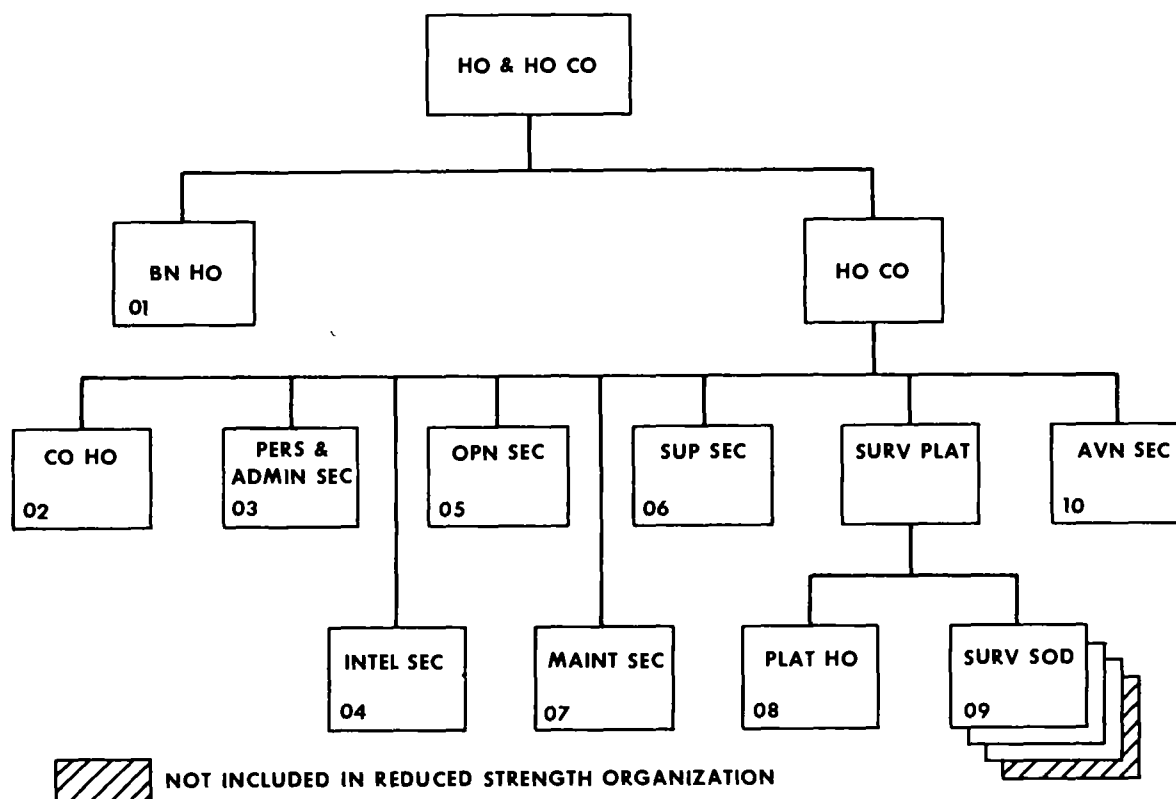


Figure 17. Headquarters and headquarters company.

furnishes engineer survey information required by an army in the field.

a. The company consists of a company headquarters, personnel and administration section, intelligence section, maintenance section, operations section, supply section, a survey platoon consisting of a platoon headquarters and four field survey squads and an aviation section. See organizational chart, figure 17.

b. This unit is 100 percent mobile and 100 percent air transportable in USAF aircraft.

being conducted in expansible van sections of six basic designs, namely—

- (1) Copy and supply.
- (2) Photomapping.
- (3) Cartographic.
- (4) Multiplex.
- (5) Rectifier.
- (6) Map revision.

c. The company is organized for a continual two shift operation. Each photomapping platoon is manned to operate the technical equipment in the multiplex, rectifier, cartographic

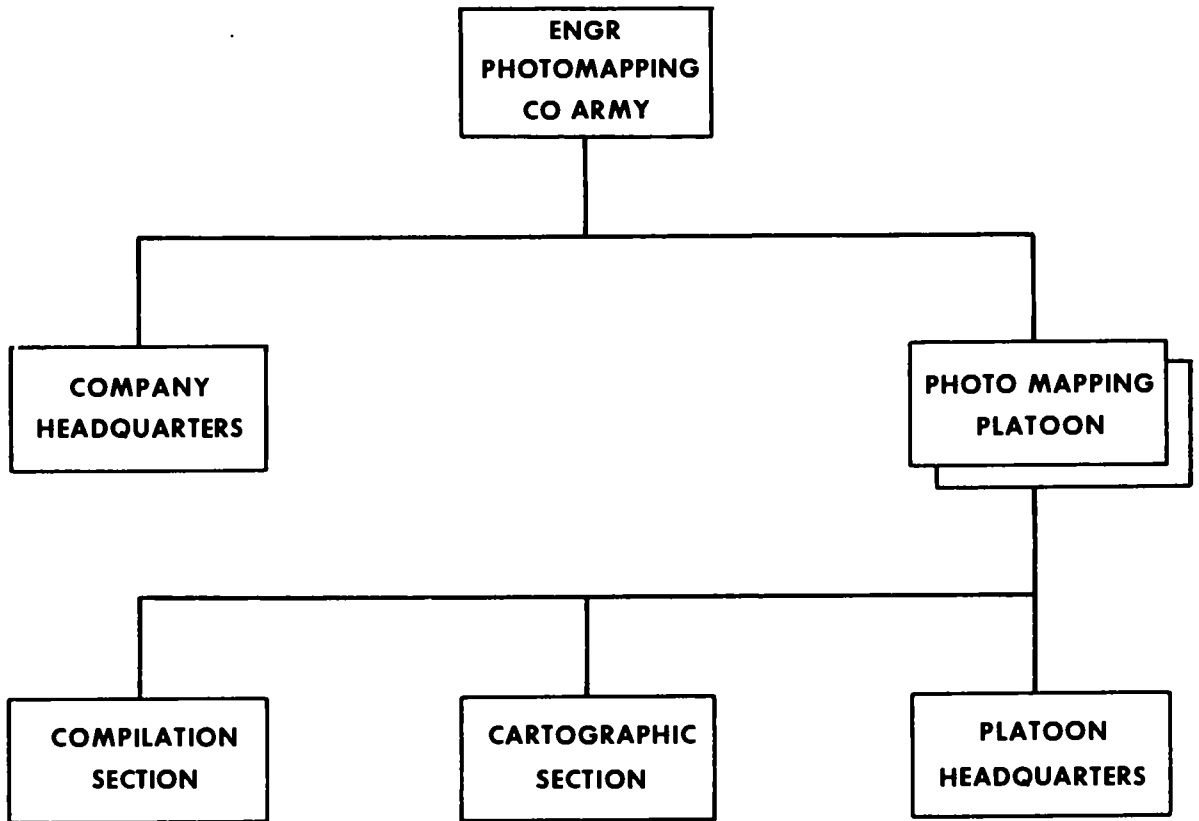


Figure 18. Engineer photomapping company, army.

and map revision van sections. The company headquarters is manned to supervise, control, and support the two photomapping platoons. Additional transportation will be required to move personnel, equipment, and the paper required to support operations for approximately one month. Organic transportation can move personnel, equipment, and paper stocks required for one month's operation by making four additional trips with the cargo vehicles.

d. Company missions are—

- (1) To compile and revise planimetric topographic and special maps and map substitutes.
- (2) To extend ground control by photogrammetry for artillery and missile fire in order to increase the field army's combat effectiveness.
- (3) To see that individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations

against hostile ground attack.

63. Engineer Map Reproduction and Distribution Company, Army

a. The engineer map reproduction and distribution company, army, consists of a company headquarters, a reproduction platoon, and a map distribution platoon which operates the army map depot. The organization of the company is shown in figure 19.

b. The company is 100 percent mobile, additional transportation will be required to move the paper stocks and maps required to support operations. It is equipped with trucks and trailers. The map reproduction equipment is mounted in van-type trucks of six basic designs, namely—

- (1) Camera.
- (2) Laboratory (and Opns Hq).
- (3) Map Layout.
- (4) Photomechanical (photo processing).
- (5) Plate process.
- (6) Press process.

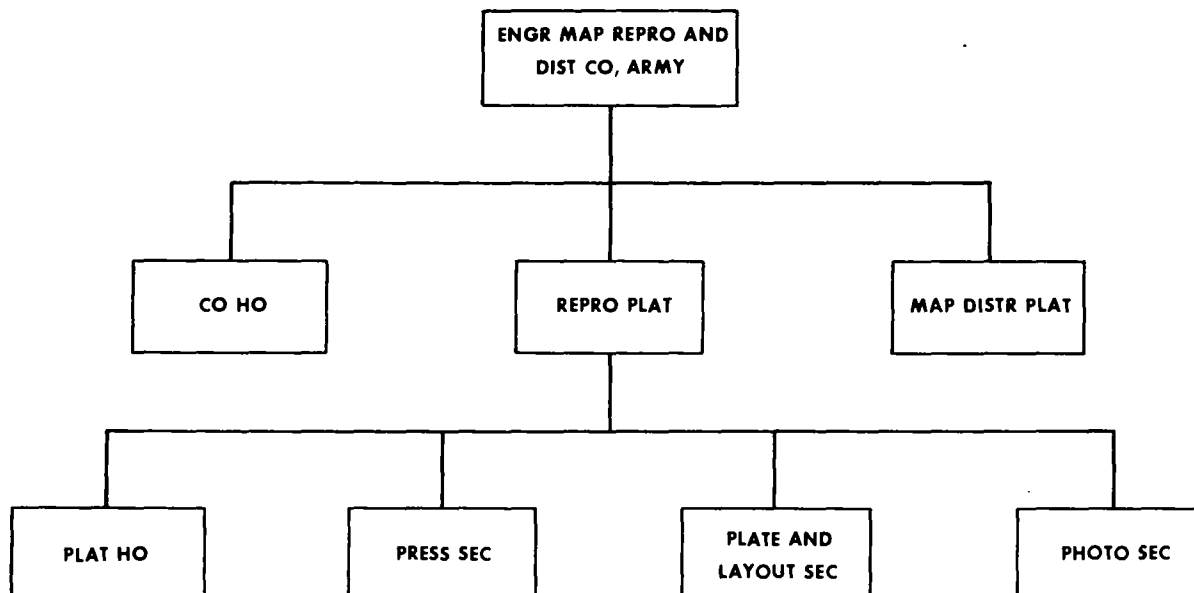


Figure 19. Engineer map reproduction and distribution company, army.

c. The mission of the engineer map reproduction and distribution company, army, is to reproduce, store, and distribute new and exist-

ing maps, photomaps, overlays, and other intelligence material. The company may fight as infantry when required.

Section II. BATTALION OPERATIONS

64. General

a. Battalion operations include the capabilities necessary to provide maps and engineer survey information as required for an army in the field. This includes the ability to—

- (1) Perform surveys and provide survey information required by an army in the field.
- (2) Reproduce maps, photomaps, overlays, overprints, and other intelligence material at the approximate rate of 3,500,000 impressions per month at full strength capacity.
- (3) Store and distribute maps and related materials required by army troops.
- (4) Prepare maps, photomaps, map mosaics, sketches, drawings, and related materials for use by an army in the field.
- (5) Perform organizational maintenance on all organic vehicles and third echelon maintenance on all organic topographic survey and reproduction equipment.

b. The battalion is organically equipped to function as a separate unit and is administratively self-sustaining. Organic equipment includes surveying, map compiling, and map reproduction equipment.

c. Army signal troops provide the battalion with access to the army area communications system. The battalion headquarters installs and operates organic telephone switching facilities and provides telephone service to company headquarters. Companies provide messenger service to their platoons.

65. Command Operations

The battalion commander is responsible for the discipline, maintenance, supply, administration, tactical and technical efficiency, and combat readiness of the battalion. In addition, the battalion commander—

a. Locates his headquarters near army headquarters to provide for close coordination in the planning and execution of mapping activities for which the army commander, the G2, and the army engineer are directly or indi-

rectly responsible, and to facilitate liaison with the artillery commander and the G2 air.

b. Obtains all available mapping material, including existing maps, aerial photographs, and ground control from higher headquarters. With the assistance of the battalion staff, evaluates the data in terms of additional aerial photo coverage, ground control, and revision; and prepares plans for amplifying and improving existing map data.

c. The personnel and administrative section of battalion headquarters is divided into a general administrative subsection and a personnel subsection.

d. The personnel subsection, under the supervision of the military personnel warrant officer, operates a central personnel office, processes, and maintains all personnel records for the battalion.

66. Intelligence

a. The intelligence section of the battalion is responsible for the production of engineer intelligence. Engineer intelligence is as much a product of the battalion as maps. It includes terrain studies, map intelligence, and survey information.

b. The engineer intelligence officer (S2) supervises the intelligence section of battalion headquarters and is responsible to the battalion commander for the following intelligence activities:

- (1) Staffing the army survey information center.
- (2) Preparing terrain studies and other engineer intelligence studies.
- (3) Collecting and filing map and survey source material.

c. The engineer intelligence officer may be assigned the following counterintelligence activities:

- (1) Supervising the camouflage activities of the battalion.
- (2) Checking the security of all operations of the battalion.
- (3) Exercising staff supervision over the headquarters and service company command on local security measures.

d. The intelligence section staffs the army survey information center. The section interprets tactical and technical information, collects map and survey information, and prepares terrain studies and other engineer intelligence reports.

67. Operations

a. The responsibilities of the operations officer (S3) include training and the planning and supervision of technical and tactical operations of the battalion.

b. During the mobilization period and at other times when the battalion is not engaged in mapping operations or planning for one, the operations officer and his section are primarily concerned with training activities.

c. During the map production planning stage, the battalion operations plans are prepared by the operations officer in coordination with the other staff sections and under the direction of the executive officer. The operations officer's responsibilities during the planning stage include—

- (1) Evaluating available mapping data in coordination with the engineer intelligence officer and the photomapping company and survey platoon commanders.
- (2) Preparing mapping specifications.
- (3) Preparing specifications for aerial mapping photography.
- (4) Recommending the assignment of mapping tasks to units and technicians of the battalion.
- (5) Assisting the survey platoon and corps topographic companies in the initial phases of establishing control for survey work.
- (6) Preparing forms for essential map production reports, such as personnel, equipment, supply, progress, and completion reports.
- (7) Preparing work flow charts of the various phases of map production to insure coordinated mapping operations.

- (8) Planning troop movements to bivouac areas.
- (9) Preparing the battalion defense plan.
- (10) Preparing the standing operating procedure for routine operations.
- (11) Preparing battalion operation orders based on the above planning operations and information provided by the other staff sections.

d. During map production operations, the operations officer's responsibilities include—

- (1) Supervising the execution of battalion operation orders.
- (2) Designating general areas for unit bivouac and working areas.
- (3) Coordinating and supervising troop movements to bivouac areas.
- (4) Maintaining liaison with the army engineer intelligence division, G2 air, and the artillery.
- (5) Inspecting and coordinating the flow of map production through the various units of the battalion.
- (6) Providing technical inspections by the technical specialists of the operations section to insure adherence to mapping specifications, compliance with higher headquarters directives, and use of sound map production practice.
- (7) Making final edit of maps prepared by the battalion.
- (8) Preparing the command report (AR 345-105).
- (9) Making plans for future mapping operations.

e. The operations section consists primarily of specialists who assist the operations officer in his technical responsibilities of map production planning, control and coordination incident to survey control, topography, photolithography, and map editing. The map reproduction officer has the additional duties of training and troop information and education officer.

f. Upon receipt of the battalion mapping mission and based on the evaluation of available mapping data by the operations section, the operations officer and his assistants break down the mission into new mapping, revision of existing mapping, and reprints.

g. New mapping involves the following steps:

- (1) The operations section checks new mapping requirements; sets up a time schedule for the various production phases in accordance with completion time specified by higher headquarters; and forwards copies of time schedule to other staff sections and unit commanders. The operations section assembles all available control data and sends copies to the survey platoon and the photomapping company. Instructions are issued to the survey company for such additional control as may be needed.
- (2) The survey platoon completes the necessary horizontal and vertical control and computations and forwards the data to the operations section.
- (3) The operations section checks the computations and forwards the control data to the photomapping company.
- (4) The photomapping company's operations section prepares work schedules for the photomapping platoons for the necessary compilation and drafting. Upon completion of the work, it is forwarded to the operations section.
- (5) The operations section edits the final map manuscripts and forwards them to the reproduction and distribution company for proof copies.
- (6) The reproduction and distribution company headquarters sends the map manuscript to the reproduction platoon which runs off proof copies and forwards them to the operations section.
- (7) The operations section checks the proof copies, has corrections made where necessary and, after final ap-

proval, forwards them to the reproduction and distribution company for reproduction and distribution.

- (8) The reproduction and distribution company headquarters sends approved proof copy to the reproduction platoon which runs off the required number of copies. The maps are then forwarded to the map distribution platoon for storage and distribution at the army map depot, copies being forwarded to the operations section for its permanent file.

h. Revision of existing maps generally does not require survey operations and operations follow *g* (4) through (8) above.

i. Reprints require only reproduction and distribution and follow *g* (1), and (6) through (8) above.

j. Careful coordination of the production phases by the operations section is necessary to see that bottlenecks do not develop. If a situation arises where too much manuscript material is completed by the photomapping company for the reproduction company to handle, the operations officer should arrange for some cartographic drafting assistance to be furnished the reproduction company by the photomapping company. If manuscripts are slow, sheets should be examined and those that show topographic detail and other data (which in themselves would make an acceptable map for provisional or emergency use) should be forwarded to the reproduction company for a run.

68. Supply

a. The supply officer is responsible for the following supply activities:

- (1) Planning and directing procurement, storage, and issue of all supplies and equipment in the battalion.
- (2) Supervising supply records in all units of the battalion.
- (3) Exercising staff supervision over the maintenance section and, assisted by the maintenance section chief, coordinates the operations, dispatch, and maintenance and repair of wheeled

vehicles and engineer equipment assigned to the battalion. Consults with operations officer to determine allocations and priorities for transportation.

- (4) Planning and supervising operation of utilities, such as water supply and electric power.
- (5) Maintaining close liaison with all supporting supply establishments.
- (6) Supervising the evacuation of supplies and equipment, in coordination with the operations officer.
- (7) Conducting continuous training of supply specialists, both in the battalion supply section and in the supply elements of subordinate units.

b. The supply section requisitions, stores, and issues supplies and equipment required by the battalion, including local procurement and manufacture. The section also assists the supply officer in carrying out his supply and maintenance responsibilities by field inspections.

69. Maintenance

a. The maintenance section chief, under the guidance of the battalion supply officer, is the principal advisor on all matters pertaining to automotive and topographic and reproduction equipment maintenance.

b. Duties of the maintenance section chief include—

- (1) Coordination of equipment and vehicle operations and repair activities.
- (2) Inspection of preventive maintenance procedures, including the enforcement of safe driving practices.
- (3) Conduct of inspections to determine condition and state of maintenance of vehicles and equipment.
- (4) Coordination of convoy operations, including loading and unloading of vehicles and equipment of vessels and railroad cars.
- (5) Maintenance of appropriate records and submission of required reports.

(6) Preparation of unit SOP's pertaining to motor pool operations and maintenance of topographic and reproduction equipment.

(7) Coordination with the supply officer to determine maintenance priorities, allotment of special equipment, and the adjustment of unit work loads.

c. The maintenance section, under the staff supervision of the battalion supply officer, is directly supervised by a topographic reproduction technician warrant officer. Enlisted personnel of the maintenance section consists of the motor sergeant, wheeled vehicle mechanics, reproduction equipment repairmen, instrument repairmen and electricians, and a power-generator operator. The maintenance section performs organizational maintenance of all wheeled vehicles and engineer equipment of battalion headquarters and headquarters and headquarters company; performs organizational maintenance beyond the capacity of the companies of the battalion; conducts preventive maintenance inspections; operates a motor pool for battalion headquarters and headquarters and headquarters company; and furnishes technical advice on equipment and maintenance problems to the other elements of the battalion.

d. Parts supply is closely connected with maintenance. The battalion maintenance section chief works in close coordination with the supply section to maintain effective parts supply. Repair parts channel through the engineer and ordnance field maintenance companies. The physical location of these companies depends on the local situation. Where army engineer and ordnance depots are convenient to the battalion, the field maintenance companies function largely as expediting and control units. Where army depots are some distance away or the battalion is scattered, the engineer and ordnance field maintenance companies act as repair parts supply points, which receive and store parts and issue them directly to the engineer topographic units.

e. Maintenance operating procedures for the battalion should be guided by the following essential maintenance factors:

(1) Every piece of engineer equipment and every vehicle should have an assigned user, operator, or driver who performs daily and weekly servicing under supervision.

(2) Repairs are performed on the lowest level of maintenance consistent with the nature of the repair, authorized repair parts, tools, time available, skill of personnel, and the accessibility of the next higher maintenance level. For example, field survey work should not be delayed by sending an instrument away for adjustment if a member of the unit can possibly make the adjustment.

(3) Each level of maintenance performs any of the overflow maintenance functions of lower levels when required by practical considerations.

(4) Shop areas should be located adjacent to access roads. Hardstands and covered shop areas increase work output.

(5) An adequate maintenance library (TM's and LO's) should be maintained at each level for all items of organic equipment, including pertinent supply manuals (ENG, ORD, and SIG).

(6) Maintenance SOP's should be firmly enforced throughout the command.

70. Map Supply and Distribution

The battalion map distribution officer, S3, is the principal adviser to the battalion commander on all matters affecting the distribution of maps. In coordination with the army engineer intelligence section, he prepares the map distribution plan for the army map depot which is operated by the map distribution platoon of the engineer reproduction and map distribution company of the battalion. The battalion map distribution officer makes periodic inspections for the battalion commander of the operation of the map distribution system of the army map depot, to include periodic checks on initial and replenishment allowances, stock levels, security measures, and delivery schedules. He also maintains liaison with base and corps map depots.

Section III. HEADQUARTERS AND HEADQUARTERS COMPANY

71. Mission

Headquarters and headquarters company provides command and staff, administration, supply and maintenance support for the engineer topographic battalion, army, and furnishes engineer survey information required by an army in the field.

a. Battalion headquarters provides command and staff elements of the battalion.

b. Company headquarters provides command, administration, mess, and supply for the company.

72. General Employment

At full strength the company is trained and equipped organically to—

a. Provide personnel for the staff sections of the battalion.

b. Perform necessary unit supply and messing in support of the battalion personnel.

c. Perform necessary surveys as required for topographic mapping; carry forward ground control and azimuth data in support of corps survey elements. Provide survey support for missiles, surveillance devices and conventional artillery.

d. Provide supplementary survey personnel for engineer combat units.

73. Survey Platoon

a. The survey platoon has equipment to accomplish triangulation, trilateration, traverse, leveling, astronomic position and azimuth determination, and plantable surveys. In addition, it has sufficient machines for the computation and adjustment of field data. It conducts mapping surveys; establishes geodetic control for missile support, surveillance devices, and conventional artillery. The geodetic control is used by the topographic battalion, by the topographic company, and by artillery units.

b. The survey platoon consists of a platoon headquarters and four field survey squads. The survey squads are capable of performing a high degree of survey which includes second and third order survey required by an army

in the field. The surveys are accomplished by utilizing the latest type equipment including electronic distance measuring equipment.

c. Personnel comprising the survey platoon are as follows:

- (1) *Platoon headquarters.* Platoon leader, warrant officer survey technician, surveyor supervisor, topographic computers, riggers, a radiotelephone operator, and light truck drivers.
- (2) *Field parties.* Each of the four survey squads consists of a section chief, geodetic surveyors, topographic surveyors, topographic survey recorders, topographic computers, and rodmen-tapemen.

74. Survey Platoon Operations

a. The survey platoon leader is responsible to his company commander for the discipline, training, control, and the technical and tactical employment of his platoon. He should be thoroughly familiar with the employment and care of the equipment and materials as well as the weapons of the platoon. He should know the capabilities and personal characteristics of each man in his platoon. In the performance of his normal technical duties, the survey platoon leader—

- (1) Analyzes the survey projects assigned his platoon and works out the job organization by subdividing the work into tasks that can be accomplished by his headquarters and survey squads.
- (2) Allocates necessary personnel and equipment support from platoon headquarters to the survey squads.
- (3) Requests equipment support from company headquarters, when necessary, to supplement platoon equipment.
- (4) Supervises the execution of platoon tasks to see that proper operational methods are followed, standards complied with, deadlines met, equipment

properly employed and maintained, and topographic supplies economically utilized.

- (5) Establishes proper safeguards for the work being performed by his platoon.

b. In addition to the normal command functions listed above, the survey platoon commander—

- (1) Considers the time factor and his available equipment and men when selecting methods in prosecuting the assigned survey work.
- (2) Arranges field survey work so that each phase of the work will be a continuous part, adjacent to similar work previously completed or worked on by other parties. This will permit the battalion operation sections to provide provisional maps with the latest information prior to the completion of the battalion mapping program.
- (3) Establishes priorities in laying out the field work so that the most essential field control is procured first and submitted by increments to the battalion operations section as it becomes available, for forwarding to the engineer photomapping company.
- (4) Makes reconnaissance to select triangulation points, to locate sites for signal lines and towers, to clear lines of sight, to obtain permission to cross private property, and to locate bivouac sites.
- (5) Makes decisions as to what method of survey will be utilized for extending horizontal control. These decisions will be based on time allotted, terrain, tactical situation, and economy of manpower.
- (6) Arranges for necessary differential leveling.
- (7) Sets up all control data as a permanent, accessible record for future revisions.
- (8) Develops well-trained survey parties for triangulation, trilateration, trav-

erse, and level lines, all well-versed in the selection, pricking, and transferring of picture points.

- (9) Trains at least two plane table parties in the platoon to handle small jobs for which aerial photomapping is unavailable.

c. The survey technician warrant officer is responsible for the platoon's close technical direction, leaving the platoon leader free for supervision and planning. He supervises the maintenance of records, and progress reports and checks to see that deadlines are met. In the performance of his work, the survey technician warrant officer—

- (1) Supervises and coordinates the work of the field parties and the computing personnel.
- (2) Secures the astronomical data, the location of current ground control, and other related matters from the battalion operations section.
- (3) Sees that office copies of field notes are actual transcripts from original field notebooks and are submitted promptly as required by platoon headquarters.
- (4) Insures that the computers make immediate computation and adjustment of horizontal and vertical control; checks the resultant data; has it compiled; and transmits the data to the battalion operations section for forwarding to the engineer photomapping company.
- (5) Sees that all control points are properly established and identified so they may be readily found again.
- (6) Insures that independent checks are made by members of his platoon at each step to avoid mistakes and eliminate unnecessary time-consuming work.
- (7) Coordinates topographic control for the engineer topographic companies, corps, and the artillery.

d. The surveyor supervisor, the platoon sergeant, in addition to his administrative duties and responsibilities—

- (1) Supervises and coordinates the field operations of the four field survey squads.
- (2) Holds each member of a field party responsible for the proper use and safe return of his equipment; sees that breakage, damage, or loss is reported promptly; that equipment is examined when assigned and report made of any injury or deficiency found.
- (3) Alternates members of each field party in the discharge of duties in order that on-the-job training may be continuous.
- (4) Sees that field notes are properly kept, that they are complete and legible, that no erasures or alterations have been made, and that rejection of figures or pages are made by neat cancellations.
- (5) Checks the field notes and turns them over to the platoon leader.

e. Section chiefs (squad leaders) are responsible to the platoon leader for the control, training, and operational efficiency of their field parties. They should possess a detailed knowledge of the duties of all members of their parties and of the maintenance and operational procedures of work assigned their parties, including a detailed knowledge of the care and use of topographic equipment and supplies. They should also possess a knowledge of basic infantry tactics and the possible combat duties of the individual member of their parties.

- (1) Each section chief has the general duties of supervising his field party; maintaining discipline and harmony among the members of his party; determining procedure of survey work; assigning duties to individual members of his party; inspecting the work of the party for accuracy and neatness; keeping time and production records of the party; and arranging for on-the-job training of individual members of his party and of replacements.

- (2) The section chief directs the work of his party and assists in the more difficult work.

75. Aviation Section

The aviation section provides the necessary aircraft essential to the survey mission. Under the present concept of increased unit dispersion, rapid deployment, and the introduction of electronic survey instruments for topographic surveying, the utility helicopters are indispensable to the engineer topographic battalion, army. Increased artillery survey control requirements within the army and the decreased lead time available for the establishment of survey control points make a rapid and reliable means of establishing control points mandatory. This capability is provided by the topographic battalion's aircraft and the electronic survey instruments. The aircraft may be utilized for reconnaissance and transportation of personnel and equipment as required.

76. General Employment

a. The aviation section is trained and equipped to—

- (1) Provide lift for survey teams performing topographic surveys in areas inaccessible by road or when speed is essential.
- (2) Provide lift for rapid deployment and to speedily resupply survey squads operating in the field.
- (3) Perform preliminary aerial survey of assigned areas prior to actual ground survey by survey squads.
- (4) Furnish lift for special equipment, including electronic survey instruments when required for the accomplishment of the survey mission.
- (5) Provide a means for the commander and other personnel to adequately supervise the survey operations.

b. The aviation section consists of a section leader, lieutenant (rotary wing aviator), three helicopter warrant officer pilots, crew chiefs, and other aircraft maintenance personnel to assure continual operation of the aircraft. The

section leader in addition to supervising the employment of the section, maintains close coordination with all elements of the battalion staff and the survey platoon to insure that the aircraft are fully utilized to further enhance the accomplishment of the battalion mission. The three helicopter pilots fly the three assigned helicopters for airlift operations; however, the section leader may fly when the warrant officer pilots are not available. This section is the key to the timely accomplishment of the battalion's survey mission; therefore, it is

Section IV. ENGINEER PHOTOMAPPING COMPANY, ARMY

78. Capabilities

At full strength this unit has the following capabilities:

a. Prepares photomaps and mosaics (controlled and uncontrolled) for the field army as required.

b. Provides extension of ground control by photogrammetric means from a strip or strips of aerial photography to a distance of about 50 miles beyond existing ground control within a period of approximately 36 hours, to include preparation of a gridded area graphic.

c. Has limited capability for preparing new maps, from aerial photographs, existing maps, charts, and other sources.

79. Assignment

This unit is organic to the engineer topographic battalion, army.

80. Mobility

This unit is approximately 75 percent mobile with organic equipment and personnel. Additional transportation will be required to move personnel, equipment, and the 30 tons of paper required to support operations for approximately one month. Organic transportation can move personnel, equipment, and paper stocks by making four additional trips with the cargo vehicles. This unit is 100 percent air transportable in USAF aircraft.

81. Company Headquarters

a. The company headquarters provides command, administrative, mess, supply, and main-

tenance support for the platoons of the company.

tenance support for the platoons of the company.

77. Tactical Operations

Tactical operations of headquarters and headquarters company are limited to local security of the company and battalion headquarters and fighting in self-defense. The cal. 7.62 machineguns are assigned to the company and the battalion maintenance section for local security of company and battalion headquarters.

b. The company headquarters consists of administrative, mess, supply, and maintenance personnel.

c. Personnel comprising the company headquarters are as follows:

(1) *Command element.* Company commander, company executive officer.

(2) *Administrative section.* First sergeant and company administrative clerk.

(3) *Mess section.* Mess steward, cooks, and helpers.

(4) *Supply and maintenance section.* Supply sergeant.

d. Company headquarters, besides its normal housekeeping equipment, has tools for organizational maintenance, a carpenter set for improvement of local facilities, electric lighting equipment, and photomapping and reproduction equipment for use by the photomapping platoons. The operations section has computing machines. Each platoon is equipped with van-type trucks for mobile map compilation and drafting areas.

82. Operations Section

a. Technical operations of the company are planned, supervised, and controlled by the personnel of the operations section under the direction of the company commander and his operations officer (also executive officer). This

includes the final edit of technical operations of the platoons of the company.

b. In addition to the operations officer, personnel comprising the operations section are the photomapping technician warrant officer, cartographic control sergeant, map compilers, topographic computers, a draftsman, process photographer, and a clerk.

c. The operations officer, in charge of the operations section, prepares technical instructions, specifications, and work schedules for the approval of the company commander. After approval, he forwards them to the platoon headquarters of the photomapping platoons for action.

d. Upon receipt of the control data from the survey platoon of headquarters and service company, the cartographic control sergeant and the topographic computers of the operations section make the computations for the grid coordinates of the projection and other ground control. From these computations, they prepare working diagrams which are forwarded to platoon headquarters of the photomapping platoons for the preparation of control sheets and control boards by the drafting sections of these platoons.

e. The photomapping warrant officer, assisted by the clerk-typist and the draftsman, maintains production records and progress reports. He reviews these reports and checks to see that deadlines are met.

f. The operations section also maintains a photo and map source material library.

g. Upon receipt of the final drafted map manuscript and mosaics from the photomapping platoons, the chief map editor of the operations section, assisted by the map editors, makes the final company edit and forwards them to battalion headquarters for final edit and forwarding to the engineer map reproduction and distribution company, army, where the negatives and plates are made. If time permits, press proofs are returned to the operations section for final edit and any changes that may be required.

83. Photomapping Platoons

a. The photomapping platoons revise existing maps, construct photomaps, make map

overlays and map substitutes, and prepare overprints for special purpose maps. The platoons are concerned primarily with the revision of large-scale topographic maps required by the army and the production of planimetric maps.

b. Each of the two identical platoons consists of a platoon headquarters, a compilation section, and a drafting section.

c. Personnel comprising each photomapping platoon are as follows:

- (1) *Platoon headquarters.* Platoon leader and platoon sergeant.
- (2) *Compilations section.* Section chief, map compilers, multiplex map compilers, a process laboratory specialist and helpers.
- (3) *Cartographic section.* Section chief and cartographic draftsmen.

84. Photomapping Platoon Operations

a. The platoon leader, assisted by the platoon sergeant, plans, directs, and supervises the work of the photomapping platoons. In addition, the platoon leader concentrates on the operating efficiency of his personnel. He supervises the test in stereoscopy prescribed by the company commander for platoon personnel, weeding out personnel lacking visual acuity and manual dexterity for operation of the stereoscopic plotting instruments. After deficiencies are noted, he arranges with the company commander for replacements by transfer to other units, both for the benefit of the individual and the platoon. To insure the maximum utilization of all photogrammetric equipment when the topographic plotting stage has been reached, the platoon leader programs constant training of understudies and makes certain that particular care is employed in selecting those to be developed for this work.

b. The platoon sergeant—

- (1) Makes the assignments, in accordance with the platoon commander's decisions, of the production phases to the compilations and drafting sections.
- (2) Obtains the aerial photographs required for the project from the battalion operations section; checks and forwards them to the compilations

and requests battalion operations section to obtain such additional photos as may be required.

- (3) Receives the control data from the survey platoon; checks and forwards data to compilations section.
- (4) Receives the mosaic boards and map compilation sheets from the compilations section; checks and forwards them to company operations section for edit; upon return, forwards them to the drafting section.
- (5) Receives final drawings from the drafting section; edits and forwards them to company operations section for final edit.
- (6) Maintains production records and progress reports so as to keep the platoon leader informed of production progress and completion dates.

c. The section chief of the compilation section upon receipt of the control data and aerial photographs from platoon headquarters, lays out the work for his control, mosaic laying, and compilations personnel.

- (1) He assigns some of his map compilers to the task of constructing semicontrolled mosaics.
- (2) He divides the remaining map compilers and helpers into squads, each in charge of a senior map compiler, and assigns them the task of making compilations of maps from aerial photographs onto control sheets.

- (3) The section chief checks the working diagrams prepared by the topographic computers, the mosaic boards and map compilation sheets prepared by his section, and forwards them to platoon headquarters for edit.

d. The section chief of the cartographic section, upon receipt of the working diagrams, mosaics, and map compilation sheets, assigns tasks to squad chiefs.

- (1) He divides the cartographic draftsmen into squads, placing a senior cartographic draftsman in charge of each squad. He assigns squad tasks of preparing the control sheets and boards from the working diagrams; placing the grids and marginal data on the mosaics; verifying the accuracy and adequacy of the map compilation sheets; and drafting the map manuscript.
- (2) The section chief checks the finished drawings and forwards them to platoon headquarters for final edit.

85. Tactical Operations

The company should be prepared to defend itself, or, together with the other units of the battalion, engage in a common defense of the battalion installations. In an emergency, such as a breakthrough, the company, as part of the battalion, may be used to fight as infantrymen when required.

Section V. ENGINEER MAP REPRODUCTION AND DISTRIBUTION COMPANY, ARMY

86. Company Headquarters

a. The company headquarters provides command, administrative, mess, supply, maintenance, and utilities support for the platoons of the company.

b. Personnel comprising the company headquarters are similar to that described for the engineer photomapping company, army, with the addition of a water supply specialist and helper and without the operations section personnel.

87. Capabilities

a. Personnel of the company are trained and equipped to reproduce and distribute new and existing maps, photomaps, overlays, and other intelligence material. At full strength the unit can —

- (1) Reproduce by offset lithography, single and multicolor maps, photomaps, overlays, overprints, and other intelligence material at the approximate rate of 3,500,000 impressions per month, by working two shifts per day.

- (2) By working two shifts per day, reproduce 600,000 five-color maps per month or 1,000,000 three-color maps per month. In addition, this unit can produce 500,000 impressions of other single color work per month depending on individual runs.
- (3) Receive, store, and issue map in bulk, and other related material. The map distribution platoon has the capability of handling 172,000 sheets/day received and shipped in bulk with minimum retail deliveries.
- (4) Accomplish field maintenance of reproduction equipment.

b. Company headquarters, besides its normal housekeeping equipment, has tool sets for organizational maintenance; electrician and pipe-fitting sets for improvement of local facilities; and water purification equipment. The reproduction platoon has electric lighting equipment and reproduction equipment mounted in van-type trucks. These mobile reproduction units consist of a camera, a laboratory, a photo-mechanical, a map layout, and a plate process section, and four press sections. The map distribution platoon has map distribution equipment and trucks and trailers sufficient for normal map storage requirements.

c. The company commander —

- (1) Selects the company area (after battalion operations officer designates the general area) with due regard to water supply, power, prevailing winds (dust and sand), and possible floods.
- (2) Locates company headquarters and the individual reproduction units (photographic, plate and layout, and press) so as to provide an efficient working organization.
- (3) Checks with the reproduction platoon leader the nature and availability of the water supply and modifies operation procedure to accord.
- (4) Makes sure the positioning and leveling of the mobile reproduction units

and all attachments are properly made and that reproduction equipment is properly prepared for operation.

- (5) Checks with the platoon leader of the map distribution platoon the designated location for the army map depot with regard to security, storage facilities, and ease of operations.
- (6) Confers with the battalion map distribution officer and the security officer with reference to the map distribution plan.
- (7) Supervises and coordinates the technical operations of the company, including all the necessary operations to reproduce maps and other intelligence material by lithography, and to receive, store, and distribute maps, and similar material required by army troops and corps.

88. Reproduction Platoon

a. The reproduction platoon prepares process-photography negatives and photolithographic plates for maps and other intelligence material. The platoon reproduces this material on offset lithographic presses.

b. The reproduction platoon consists of a platoon headquarters, a photographic section, a plate and layout section, and a press section.

- (1) Platoon headquarters contains personnel and equipment for supervision of the reproduction operation, and operation and maintenance of the power generation equipment. The warrant officer included in this platoon provides the experience and technical knowledge to assure a quality product.
- (2) The photographic section makes copy negatives and/or positives for offset printing and other reproductions.
- (3) The plate and layout section in support of the battalion operations prepares layouts for offset press plates,

for making offset press plates and for production related to the planimetry process, color proofs, images on serbe material and other products.

- (4) The press section prints maps, photomaps, overlays, overprints and other material.

c. Personnel comprising the reproduction platoon are as follows:

- (1) *Platoon headquarters.* Platoon leader, map reproduction technician warrant officer, photolithographic supervisor, assistant photolithographic supervisor, cartographic draftsman, power generator operators, power cutter operator, and a reproduction equipment repairman.
- (2) *Photographic section.* Senior process photographer, process photographers, and helpers.
- (3) *Plate and layout section.* Photolithographic foreman, senior platemaker, platemakers, and helpers.
- (4) *Press section.* Offset press foreman and offset pressmen.

89. Reproduction Platoon Operations

a. The platoon leader —

- (1) Makes a careful layout study of his mobile photographic, plate and layout, and press units to provide for efficient working operations.
- (2) Has tests made of the available water supply, particularly in the preparation of solutions and the thoroughness with which washing the plates and negatives can be carried out; checks fogging, scumming, precipitation of chemicals out of photographic developer solutions, and the effect on the albumen sensitizer.
- (3) Modifies procedures as required by the situation.
- (4) Checks the positioning and leveling of the mobile units, and the electrical,

water supply, drainage, and communication line attachments.

- (5) Sees that the equipment is prepared for operation; that equipment is lubricated, utensils are clean, and solutions mixed.
- (6) Sees that tests are made where necessary to determine the exposure or development time.
- (7) Sees that photographic and lithographic supplies and repair parts are on hand in sufficient quantity to perform the assigned reproduction mission.
- (8) Supervises and coordinates the work of the platoon, keeping a close check on its progress and completion dates.

b. The map reproduction technician warrant officer at platoon headquarters receives incoming work from the photomapping company and orders for re-runs of existing maps. He assigns production phases to the sections, supervises the work, and checks to see that deadlines are met.

c. The sections of the platoon are organized to operate on a two-shift per day basis at full strength.

90. Map Distribution Platoon

a. The map distribution platoon receives, stores, and distributes maps and similar material required by army troops and corps. The platoon operates the army map depot.

b. The map distribution platoon consists of map distribution, supply, and storage specialists, packing-case makers, and warehousemen.

c. The TOE of the platoon does not indicate a platoon headquarters nor a section organization. However, to provide for scheduling and phase work, the platoon is usually organized into a platoon headquarters and receiving, storage, and shipping sections.

d. Personnel comprising the map distribution platoon may be organized as follows:

- (1) *Platoon headquarters.* Platoon leader, map supply supervisor, stock-record clerks.

- (2) *Receiving, storage, and shipping sections.* Map supply and warehouse foreman, map distribution and engineer supply specialists, supply clerks, map handlers, and packing-crating specialists, warehouse equipment operator.

91. Map Distribution Platoon Operations

a. The map distribution platoon operates the army map depot which should be located in the army service area. Sufficient dry space should be provided for the storage of the map stocks, which consist of strategic and tactical maps, photomaps, road maps, negatives of reproduction materials, gazetteers, and trig lists.

b. The platoon leader, assisted by the map supply supervisor —

- (1) Locates and lays out the arrangements for the army map depot. The layout provides for receipt, handling, storage, shipping, and accounting space. Whenever possible the layout should provide receipts at one end and shipping at the other, so that both operations may be carried on concurrently without obstructing each other.
- (2) Supervises and coordinates the receipt and storage of bulk map stocks produced by the company and received from the base map depot and the distribution of bulk map stocks to corps map depot, and issue to army troop units.
- (3) Supervises the map accounting records.

- (4) Sets up regulations for carrying out the security policies of the army map supply plan, such as; armed guards for map delivery vehicles, special pass system to and from the depot, double-check systems on counting and coding shipments, and destruction of waste stocks.

c. The map supply supervisor, assisted by the supply clerks, handlers, and warehousemen —

- (1) Receives the bulk shipments of maps, checking receipts against shipping tickets and requisitions.
- (2) Handles the receipts by moving stock on order to shipping for processing and forwarding, and moving stock for replenishment to storage.
- (3) Establishes a system of storage that permits quick location of any map required for distribution.
- (4) Maintains map accounting records, such as stock levels, sheet locations, allowances, and job-record files.
- (5) Is responsible for the proper observation of security measures, especially with reference to the storage and issue of classified maps and trig lists.

d. The map supply foreman, assisted by the map distribution specialists and supply handlers and checkers, breaks down and schedules the delivery of bulk shipments by counting, packaging, addressing and shipping to army units and corps distribution points.

Section VI. TACTICAL OPERATIONS

92. General

The engineer topographic battalion, army, is responsible for its own local security and should be prepared to fight in self-defense. The battalion, normally located near army headquarters, usually becomes a part of the emergency defense plan for the entire headquarters area (par. 31).

93. Reorganization for Combat

The purpose of reorganizing the battalion for combat is to prepare the battalion for defense of its bivouac and working areas against enemy attack, or if called upon by the army, to assist in defense of an area.

a. A typical reorganization for combat of the engineer topographic battalion, army, is

shown in appendix III. Both combat and normal position titles and assignments are shown in the tabulation.

b. The battalion is reorganized into two echelons — combat or forward echelon, and security or rear echelon. The combat echelon consists of a battalion headquarters and three rifle companies: the security echelon of administration and maintenance personnel not included in the combat echelon.

c. Battalion headquarters includes, command, administration, communications, operations-intelligence, and ammunition sections.

d. The photomapping and map production and distribution companies each have a company headquarters, a weapons section, and two identical rifle platoons of two sections of two rifle squads each. Headquarters and headquarters company has a similar company headquarters, a weapons section of three weapons squads, and one rifle platoon of two sections of three rifle squads each. The assignment of weapons squads to company headquarters provides firepower for the support of its platoons, for the defense of battalion and company headquarters, and bivouac and working areas.

e. The battalion security detachment consists of administrative and maintenance personnel not included in the combat echelon. The security detachment is responsible for local security of bivouacs and working areas, fire fighting, damage control, preparation and distribution of hot meals, and preparation of equipment for evacuation in the event bivouacs and working areas become untenable. The battalion map distribution, supply, and maintenance officers are normally assigned to the security echelon.

f. Battalion headquarters provides telephone nets to company command posts. Companies provide messenger service to their platoons.

g. Rations and water are furnished elements of the combat element by the security detachment. Mess sections furnish hot meals when the situation permits; otherwise combat-type rations are issued. Ammunition supply is controlled by the ammunition section of battalion headquarters. The battalion supply warrant

officer, assisted by four supply specialists, makes up this section. Transportation and loading personnel for ammunition are furnished by the security echelon and are under the direction of the battalion supply officer. Movement of ammunition, controlled by the battalion supply section, should be direct from rear ammunition dumps to company distributing points. Other supplies, as needed by combat echelons, are sent forward by the battalion supply officer from security echelon areas.

h. The army medical unit providing medical service to the battalion provides a battalion surgeon and medical detachment. The battalion surgeon sets up the battalion aid station near battalion headquarters; supervises the operations of the medical detachment; and furnishes one aid man to each company. Litter-bearers are drawn from company personnel as required.

i. The reorganization plan usually becomes effective upon receipt of alert from army headquarters or the defense area headquarters. On alert, all engineer work ceases except water supply and limited supply and reconnaissance which is continued by the security echelon. Engineer equipment is evacuated to equipment parks designated by the commander of the security echelon. Full field equipment is retained by individuals. All other individual equipment should be loaded by the company security echelon and stored in areas designated by the battalion supply officer.

j. The reorganization for combat plan should be used during all combat training exercises.

94. Defense Against Ground Attack

Ground attack against service establishment where the battalion is located usually consists of a surprise raid.

a. Defensive measures are taken immediately upon arrival in a new area. The surrounding area is thoroughly reconnoitered and key terrain features located, an operations plan for defense is prepared as outlined in FM 7-20, and essential foxholes, weapon emplacements, and wire barriers are constructed.

b. Upon receipt of warning of a possible attack, patrols are dispatched along possible avenues of enemy approach. Upon making contact, higher headquarters is notified. The conduct of the defense is made in accordance with the principles stated in FM 7-20.

95. Defense Against Aerial Bombing and Strafing

Defensive measures by the battalion consist principally in developing a passive anti-aircraft defense. This type of defense is directed toward the protection of personnel and equipment by training personnel in aircraft recognition; digging prone emplacements for personnel near working areas and bivouacs; dispersing vehicles and equipment; concealing bivouacs and working areas; providing an effective warning system; and camouflage. Active aircraft defense is limited to engaging low-flying hostile aircraft by machinegun and small-arms fire.

96. Defense Against Chemical Attack

a. Defensive measures by the battalion consist in providing for gasproofing important battalion installations; providing a warning system; training in use of protective equipment; damage control, particularly prompt firefighting in case of incendiary attack; and decontamination of necessary areas.

b. During a chemical attack, the most important action is the enforcement of gas discipline requiring battalion personnel to make full use of protective equipment and facilities. Prompt firefighting is required in case of incendiary attack.

c. After the attack, the battalion aid station renders first aid to affected personnel, selected squads detect and mark contaminated areas. Other squads decontaminate areas, installations, and equipment necessary to reconstruct installations and defensive works and to continue the battalion's mission. See FM 21-40 for procedure.

97. Defense Against Nuclear or Radiological Attack

a. Defensive measures by the battalion consist in providing training indoctrination of all personnel in nuclear weapon effects and the few

simple protective measures taken by individuals when surprised by nuclear attack.

b. Where there is danger of nuclear attack, action is taken to see that —

- (1) Alert plan is put into effect.
- (2) Personnel working outdoors are properly clothed, avoiding unnecessary exposure of skin surfaces.
- (3) Food supplies are covered with canvas and other materials; or, preferably, placed in underground storage.
- (4) Vehicles and equipment are dispersed.
- (5) Volatile fuel supplies are dispersed.
- (6) Ammunition and weapons are protected against direct exposure.
- (7) Gasproof and bombproof shelters are prepared for use, when practicable.
- (8) Plans are prepared to extinguish all fires and shut down all powerplants not required for communication facilities.

c. After the attack, the battalion is alerted for a possible airborne attack; the wounded are cared for; trapped personnel rescued; and fires fought. The avenues of approach to a danger area is marked with warning signs, and decontamination procedures are begun. The general principles of decontamination procedures are described in FM 21-40.

98. Evacuation

a. The evacuation of a bivouac may become necessary when the battalion, together with other units in the area, becomes exposed to a large scale enemy attack.

b. Authority to order an evacuation and retirement is limited to higher headquarters. This includes authority to order abandonment or demolition of equipment and installations.

c. Based on the evacuation order issued from higher headquarters, the operations section of the battalion prepares the operation plan for evacuation. When time is pressing, the plan and the orders to elements of the battalion may have to be issued in fragmentary form.

d. Upon receipt of the evacuation order from higher headquarters, the battalion commander takes immediate action as follows:

- (1) Orders are issued to cease work.
- (2) One of the companies is designated as the covering force, and immediately begins to organize the ground for defense, establishing its outpost line, and conducting extensive reconnaissance patrolling. The company sends out details to construct road blocks and obstacles to delay the enemy advance. It establishes liaison with other units that may be in or may arrive in the area. Its mission is to defend its position and protect the rear and flanks of the command during its movement to the assembly position until the evacuation is completed. It has the additional mission of executing authorized demolitions prepared by the battalion upon its withdrawal.
- (3) Headquarters and headquarters company normally is assigned the task of coordinating the evacuation of all equipment in accordance with the priority designated by the battalion operations officer.
- (4) Demolition detachments, under the control of the executive officer, take action to insure compliance with higher headquarters directives as to

authorized demolitions. Details from the other organic companies are assigned to this group to perform demolitions by mechanical means, such as sledge hammers and fire.

e. A checklist for an operations plan for evacuation is as follows:

- (1) Cessation of work.
- (2) Designation of organic company as the covering force.
- (3) Priority of equipment evacuation.
- (4) Assignment of responsibility for withdrawal of equipment, including that of covering force.
- (5) Assignment of tasks to prepare authorized demolitions.
- (6) Destination of assembly point and routes.
- (7) Priority of movement of companies and composition of march units.
- (8) Security measures observed by march units.
- (9) Administrative, supply, and communications details.

f. When possible, arrangements should be made to evacuate some of the battalion personnel by air. This will permit the men to stay longer, evacuate more equipment, and perform more complete demolitions.

CHAPTER 7 ENGINEER BASE TOPOGRAPHIC BATTALION

Section I. ORGANIZATION

99. Composition

a. The engineer base topographic battalion consists of a headquarters and headquarters detachment, assigned or attached engineer base topographic companies, and topographic and intelligence teams.

b. The engineer base topographic battalion has a more elaborate and flexible organization than that of the engineer topographic battalion,

reproduction facilities of the base unit are built-in and require lengthy tear-down, crating, unpacking, and setting-up operations. Press erectors are required for breakdown and setup of the installation. The large stock of maps stored by the base map depot will require additional transportation and movement by shuttle.

100. Relation to Theater Headquarters

a. One engineer base topographic battalion

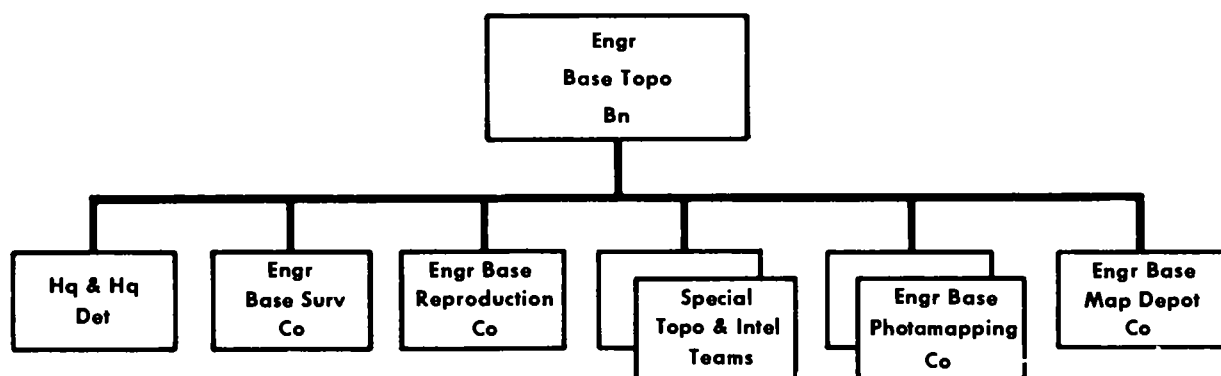


Figure 20. Engineer base topographic battalion.

army. Its organization will vary with the scope of its mission. However, the battalion normally will have assigned or attached to it an engineer base survey company, one or more engineer base photomapping companies, one engineer base reproduction company, one engineer base map depot company, and such special topographic and intelligence teams as may be required. A typical organization of the engineer base topographic battalion is shown in figure 20.

c. The battalion is essentially a stationary installation and cannot be considered mobile. When a move is ordered, except for survey and photomapping activities, the base battalion should be considered to be out of action for operational purposes for a period of weeks which will vary with specific situations. The

is normally assigned to the theater army of each theater of operations. The battalion also may be assigned to the zone of interior.

b. When the battalion is assigned to the theater of operations, it operates under the direction of the theater army engineer and executes general mapping programs calling for original maps and map revisions having a high degree of accuracy. In the zone of interior, the battalion executes long-range mapping programs under the direction of the Chief of Engineers.

101. Relation to Other Topographic Units

The battalion provides basic material, such as trigonometric lists and map reproducibles, to the army and corps topographic units. The battalion also assists the theater G2 and the

theater engineer in the preparation of terrain intelligence reports and also evaluates aerial photographs for revision and preparation of new mapping.

102. Mission

The mission of the engineer base topographic battalion is to procure, compile, reproduce, and

visory staff. The support for the battalion headquarters is located within the headquarters detachment. See organizational chart, figure 21.

b. Enlisted personnel and the equipment required for the operations of battalion headquarters are furnished by headquarters detachment.

Section II. OPERATIONS

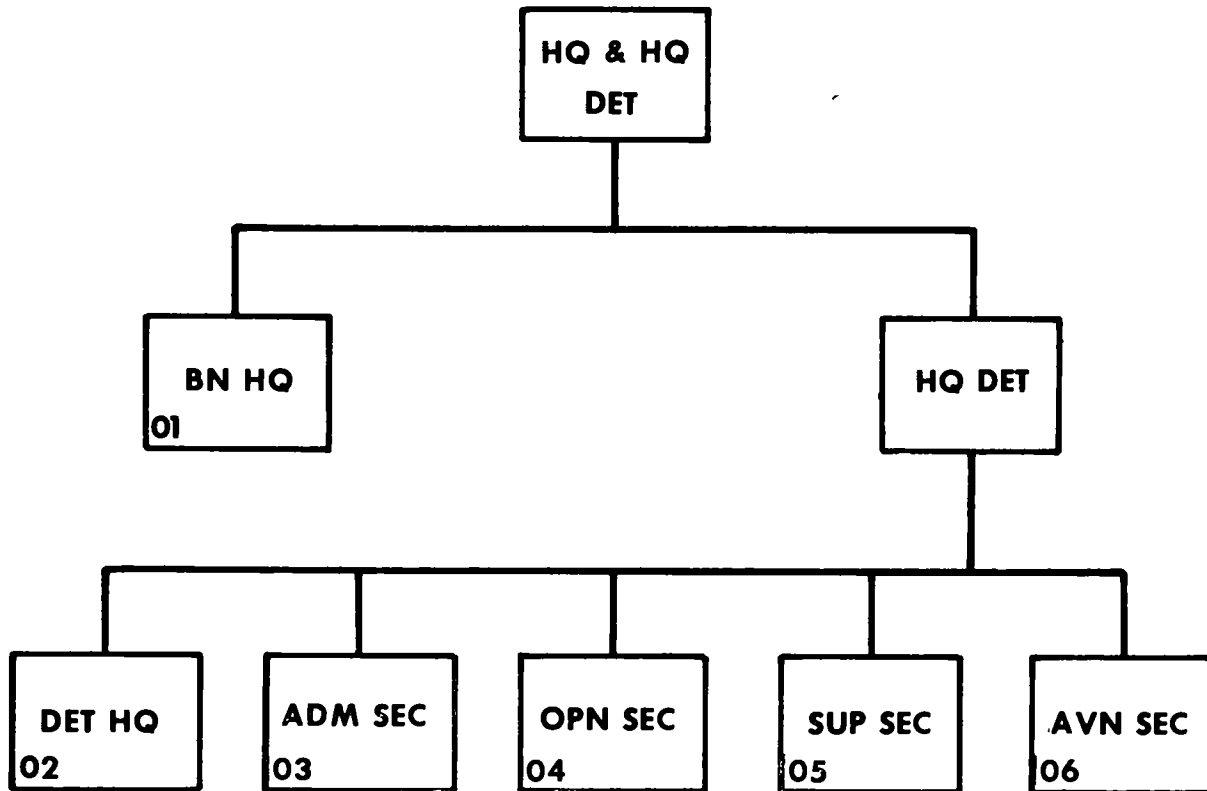


Figure 21. Headquarters detachment.

distribute military maps, which, combined with the efforts of all other assigned topographic units, will meet the requirements of theater of operations or zone of interior troops and installations; to conduct surveys of an accuracy suitable for ground control; and to assist G2 and the engineer intelligence division in topographic research.

103. Battalion Headquarters

a. Battalion headquarters consists of the battalion commander, executive officer, and ad-

c. The mission of battalion headquarters is to provide operational planning and technical control of a flexible battalion engaged in topographic survey, map compilation, map reproduction, and the distribution of military maps. At full strength, this battalion can:

- (1) Provide administration, planning, supervision and operational control of two to five engineer companies in any combination of the following units: engineer base map depot company;

engineer base reproduction company; engineer base photomapping company; engineer base survey company and/or engineer topographic or intelligence teams.

- (2) Provide organic topographic surveying to one or more field armies in a theater of operations, to a communications zone, or to the zone of interior.
- (3) Perform geodetic survey of the first, second, and third order accuracy, including first order astronomic position determinations, second and third order leveling, and the establishment of base lines.
- (4) Perform topographic surveys using conventional field and electronic measurements.
- (5) Provide necessary geodetic control data for compilation of new maps or revision to existing topographic maps by stereophotogrammetric methods.
- (6) Reproduce five million impressions per month, of multicolor close register work, working two shifts per day with long-run work.
- (7) Stock an average of five million maps and handling 450,000 maps/day.
- (8) Receive, classify, and store maps and mapping material.
- (9) Package and prepare maps and related intelligence materials for distribution to forward depots. A forward map depot operated by a storage platoon has a 150,000 map/day capability.
- (10) Compile new maps from aerial photography using photogrammetric methods and prepare controlled mosaics of same.
- (11) Revise topographic, planimetric and special maps.
- (12) Accomplish color separation, scribing, or drafting of all map compilation.

- (13) Extend ground control by photogrammetric means for missile and artillery fire.

d. The scope of the mission of the theater of operations will determine the extent to which the base topographic battalion will be augmented by additional cellular units to accomplish an expanded mission. The battalion is a flexible organization. Its capabilities are determined by the type and number of cellular units attached to it. These capabilities are described for each type of cellular unit in subsequent paragraphs. The normal organization of a base topographic battalion is described in paragraph 65. When special projects are assigned, special teams should be provided. The base topographic battalion, therefore, has almost unlimited capabilities, depending on the types of special teams by which it is augmented.

e. The battalion is organically equipped to function as a separate unit and is administratively self-sustaining. The organic equipment of the engineer base topographic battalion with its flexible added cellular units is sufficient to perform the normal mapping tasks of a theater headquarters. The battalion has equipment sufficient for administration, mess, supply, and organizational maintenance. Organic equipment of the engineer base topographic companies and teams includes surveying, compilation, reproduction, and map distribution equipment which is described under the respective organizations. The reproduction equipment is designed for stationary installation.

f. The battalion headquarters detachment installs and operates organic telephone switching facilities and provides telephone service to its companies. Theater signal troops provide the battalion with access to trunking facilities in the communications zone. The zone of interior headquarters provides trunk service for the battalion. The battalion aircraft section and aircraft section of the engineer base survey company are authorized radio sets for communications between aircraft and ground elements.

104. Command Operations

a. The base topographic battalion, under the operational control of the theater army engi-

neer, provides the necessary topographic survey and mapping requirements in conjunction with other topographic units for the theater of operations. Upon receipt of such information, the battalion commander, with the assistance of the battalion staff, makes a breakdown of the mapping requirements and mapping coverage assigned to the battalion; checks the existing available map coverage to determine which are suitable for use and require revision; determines the additional requirements for aerial cartographic photography and ground control; determines what map and mapping support should be furnished army topographic units; and, based on an analysis of the above, determines the additional topographic supplies and special and auxiliary equipment (including available indigenous equipment) that will be required to accomplish the battalion mapping mission.

b. Based on these studies, the battalion commander makes a final determination of new photography and the allocation of survey and mapping tasks to the units of the battalion. He directs his operations officer (S3) to submit the request for new photography to theater engineer headquarters and prepare the battalion operations order delegating survey and mapping tasks, including the map distribution plan, to subordinate units of the battalion. He directs the supply officer (S4) to prepare the supply schedules and directs his executive officer to coordinate these activities.

c. The battalion commander furnishes the theater engineer with progress reports containing such information as maps and charts by type, in production during the reporting period; estimated dates of completion for maps and charts in progress; number of copies of each map or chart produced; and whether maps or charts are original editions, revisions, overprints, or reprints.

105. The Battalion Staff

The battalion commander and executive officer are assisted by the battalion staff and their assistants. The battalion staff sections consist of detachment headquarters, adminis-

trative, operations, supply and aviation sections.

106. Detachment Headquarters

The detachment headquarters section is organized to provide detachment administration, as well as supply and organizational maintenance for organic vehicles and the vehicles organic to attached units that do not have this capability.

107. Operations Section

The operations section provides the personnel and facilities to assist the operations officer (S3) in formulating the operations and intelligence missions and training programs of the battalion. This section is under the direct supervision of the operation officer (S3). This section can provide a limited distribution of topographic maps on an emergency basis to combat and combat support units.

108. Supply Section

The supply section is organized along conventional lines to provide personnel and equipment to accomplish all battalion general and topographic supply functions. This section is under the direct supervision of the unit supply technician warrant officer, who reports directly to the battalion supply officer (S4).

109. Aviation Section

The aviation section provides an aviation capability of two aircraft (one fixed wing and one rotary wing), two pilots and the necessary maintenance personnel. This section provides the battalion with an organic air transportation capability which is considered essential to its mission. These aircraft will be utilized to effect control; support the topographic mission by providing an aerial reconnaissance capability, and transportation of personnel and supplies as required. In addition, the aircraft provide an organic means for courier and air messenger service between the battalion headquarters and subordinate elements and to higher headquarters.

110. Liaison With Cartographic Aviation

Close liaison should be maintained between the mapping (the battalion) and photograph-

ing (the Air Force) agencies. The preparation of specifications and priorities for aerial cartographic photography required for mapping are Corps of Engineer responsibilities. Both the mapping and photographing agencies are partners in the mapping job and neither can perform its particular functions without close liaison and a knowledge of the problems of the other. Whenever Air Force photographic or-

ganizations are assigned basic photographic missions designed to meet immediate or prospective mapping requirements, the engineer base topographic battalion commander responsible for the preparation of the maps must take the necessary steps to assign a competent engineer liaison officer to the photographic unit. This officer will command the photographic evaluation team IL.

Section III. ENGINEER BASE PHOTOMAPPING COMPANY

111. Mission

a. This company compiles and revises new and existing multicolor maps and map substitutes and extends ground control for artillery and missile fire using photogrammetric means.

b. This company consists of a company headquarters and two identical photomapping platoons. The organization of the company is shown in figure 22.

112. Assignment

This company is assigned to a communications zone or zone of the interior. Normally, it is attached to an engineer base topographic battalion.

113. Mobility

This company's equipment is fixed. When required for deployment, this unit is 100 percent air transportable in USAF aircraft.

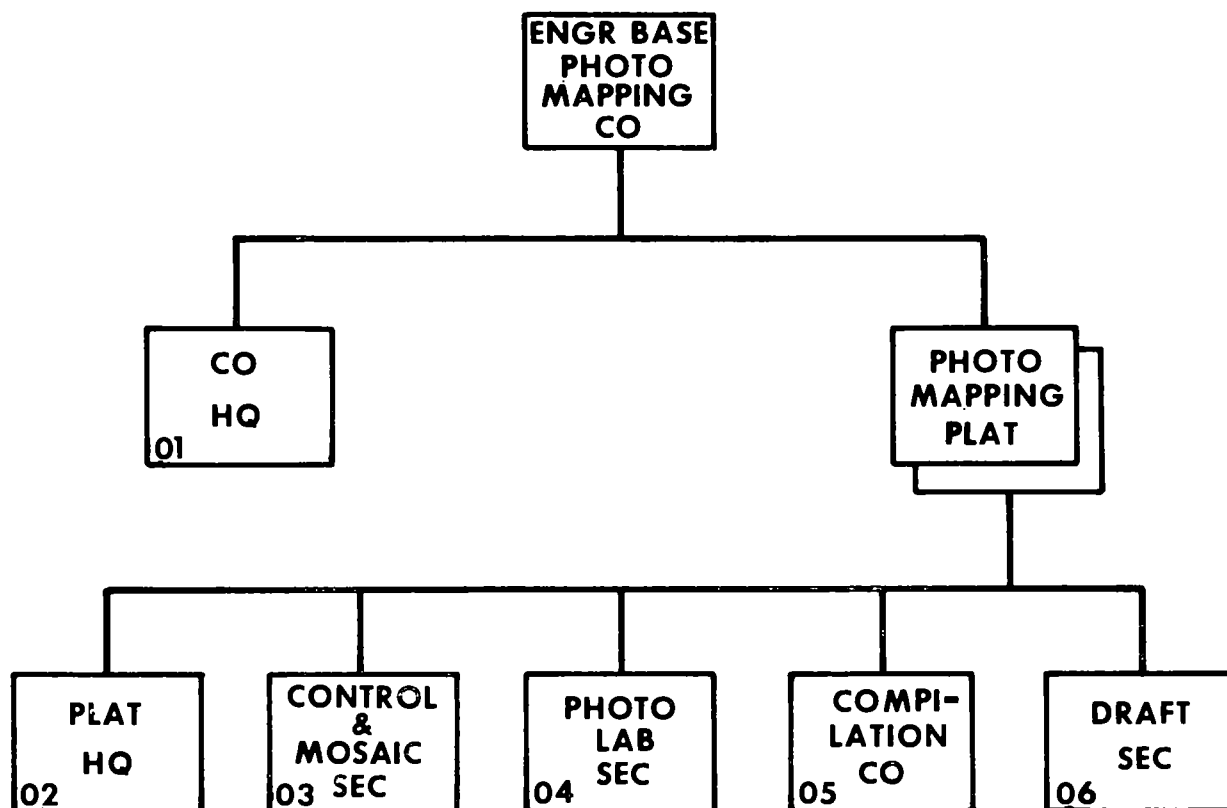


Figure 22. Engineer base photomapping company.

114. Capabilities

At full strength this unit has the following capabilities:

- a. Compiles new maps from aerial photography using photogrammetric methods.
- b. Prepares controlled mosaics of aerial photographs.
- c. Revises topographic, planimetric, and special maps.
- d. Accomplishes color separation scribing or drafting of all map compilation.
- e. Performs organizational and third echelon maintenance on organic photomapping equipment.

f. Extends ground control by photogrammetric means.

115. Company Headquarters

This headquarters provides the command, administration, mess, supply, utilities, and operational support for the platoons of the company. All equipment, except individual weapons, has been included in the company headquarters (TOE 5-349E).

116. Photomapping Platoons

Each of the two photomapping platoons consists of a platoon headquarters, a control and mosaic section, a photo laboratory section, a compilation section, and a drafting section.

Section IV. ENGINEER BASE SURVEY COMPANY

117. Mission

The mission of this company is to perform plane or geodetic surveys as required and to make necessary computations to establish, recover, or adjust geodetic position control to a given control system for use in new mapping and/or map revision projects. This unit also provides position and azimuth control to other surveying elements of the army, and extends ground control to the rear boundary of army areas in support of surveying elements of the engineer topographic battalion, army. The organization of the company is shown in figure 23.

118. Assignment

This company is assigned to a communications zone or to the zone of interior. Normally, it is assigned to headquarters and headquarters detachment, engineer base topographic battalion.

119. Mobility

This unit is 85 percent mobile utilizing organic vehicles and helicopters and is 100 percent air transportable in USAF aircraft.

120. Capabilities

At full strength this unit is capable of —

a. Providing organic topographic surveying to one or more field armies in a theater of operations, to a communications zone, or to the zone of interior.

b. Performing geodetic survey of first, second, and third order accuracy, including first order astronomic position determinations, second and third order leveling, and the establishment of base lines.

c. Performing topographic surveys using conventional field and electronic methods.

d. Providing necessary geodetic control data for compilation of new maps or revision to existing topographic maps by stereophotogrammetric methods.

e. Accomplishing any of the following under ideal conditions, per month by each of the survey squads:

(1) *Third order survey.*

(a) Triangulation — using “Quads” as the basic figure — 400 kilometers of progress.

(b) Traverse — utilizing electronic survey instruments — 600 kilometers of progress.

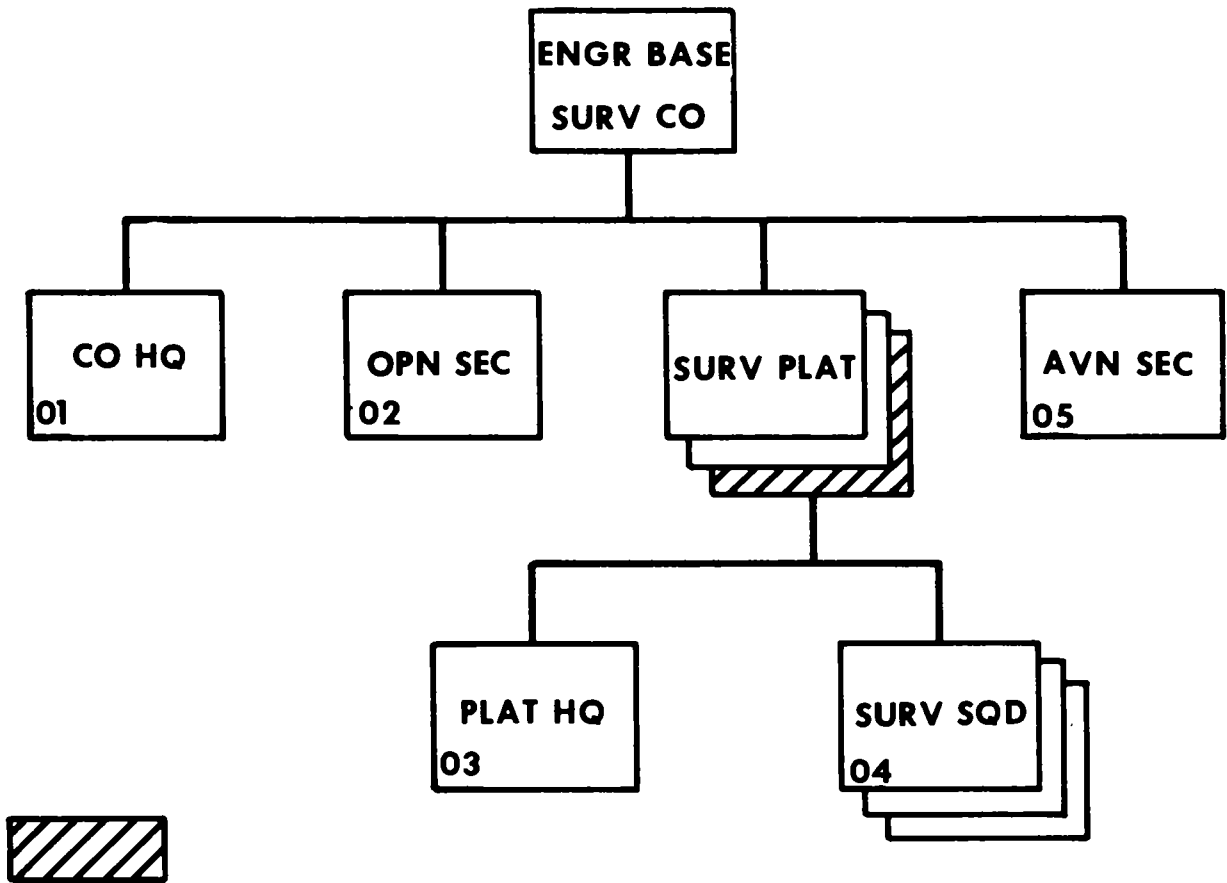


Figure 23. Engineer base survey company.

- (c) Leveling — 160 kilometers of progress.
- (2) *Second order survey.*
 - (a) Triangulation — using the “Quads” as the basic figure — 340 kilometers of progress.
 - (b) Traverse — rate of progress must be determined based on several aspects; i.e. transportation provided to move the equipment, terrain, etc.
 - (c) Leveling — 160 kilometers of progress.
- f. Completing final computations on all survey data assembled.
- g. Providing aircraft for use in accomplishing the survey mission of the company.
- h. Operating as a separate company.

i. Performing organizational maintenance on all organic vehicles and equipment and third echelon maintenance on all organic surveying equipment.

121. Employment

a. This unit is organically manned and equipped to function as a separate organization and is administratively self-sustaining. It is, however, normally assigned as an operating element of an engineer base topographic battalion in a communications zone of a theater of operations or the zone of interior.

b. This company may be employed as a separate organization to perform specific survey missions.

122. Company Headquarters

The company headquarters contains the necessary personnel and facilities by which the

company commander exercises command, control, and coordination and training activities of the unit. It provides the necessary messing facilities, administration, supply, organizational maintenance and third echelon maintenance for organic surveying equipment. The company headquarters also provides specialized high order survey equipment to the survey platoons when required.

123. Operations Section

This section provides the personnel and facilities to assist the company commander plan the technical operations of the company in accomplishing assigned survey missions. This section is under the direct supervision of the company executive officer. He is assisted by two survey technicians. The operations section coordinates the survey activities of the survey platoons, makes the necessary control computations, and controls the quality of the work. A topographic survey control sergeant, necessary draftsmen, and topographic computers have been provided to check out the computations and survey information prior to submitting to battalion headquarters. One general clerk has been provided to assist in the administrative workload of the section and performs messenger service as required. Two radiotelephone operators operate the section radio to maintain radio communications with the dispersed survey platoons employed away from the company area.

124. Survey Platoon Operations

a. The survey platoons perform the necessary plane and geodetic surveys and computations to establish, recover, or adjust geodetic ground control to a given system for use in new mapping and/or map revision. They also provide position and azimuth control and extend ground control to the rear boundary of army areas in support of surveying elements of the engineer topographic battalion, army.

b. There are three survey platoons each or-

ganized with a platoon headquarters and the survey squads.

c. Personnel comprising each of the three identical survey platoons are as follows:

- (1) *Platoon headquarters.* Platoon leader, survey supervisor topographic computer, assistant topographic computer, and radiotelephone operator.
- (2) *Survey squads.* There are nine survey squads (three per platoon), each composed of a survey section chief, three topographic surveyors, three topographic survey recorders, one topographic computer, four rodmen-tapemen, in each squad. These squads are capable of being subdivided into smaller survey field parties, usually of three men each, for the accomplishment of specified survey missions.

125. Aviation Section

The aviation section provides air transportation to the mission of the organization, technical inspections, reconnaissance, and transporting other personnel and equipment as required. The section is under the direct supervision of a rotary wing aviator and includes three utility helicopter pilots, an aviation electronic equipment mechanic, and the necessary aircraft maintenance personnel.

126. Tactical Operations

The company's normal tactical operations are limited to local security and fighting in self-defense. Armament consists only of individual weapons. However, the company is designated a Category III unit and when attached to a field army or independent corps, its armament is augmented by 7.62-mm machine-guns, and rocket launchers. In an emergency, such as a breakthrough, the company, as part of the battalion or a local area defense force, may be used to fight as infantrymen when required.

Section V. ENGINEER BASE REPRODUCTION COMPANY

127. Mission

This company provides personnel and facilities to reproduce maps, charts, and allied map-

ping materials, such as map indexes, trig lists, and gazetteers as required. The organization of the company is shown in figure 24.

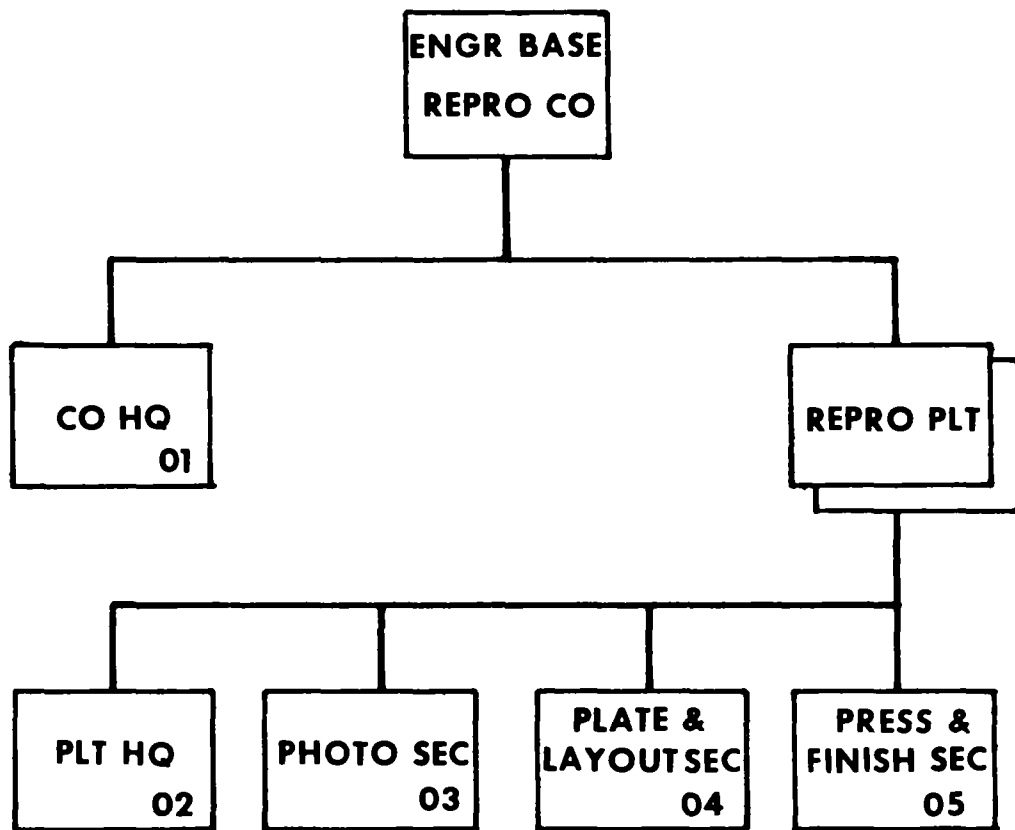


Figure 24. Engineer base reproduction company.

128. Assignment

This company is assigned to a communications zone or the zone of interior. Normally it is attached to headquarters and headquarters company, engineer base topographic battalion.

129. Mobility

This company's equipment is fixed. When required for movement, the unit is 100 percent air transportable in USAF aircraft.

130. Capabilities

At full strength this unit has the following capabilities:

a. Providing reproduction support to one or more field armies in a theater of operations, to a communications zone or to the zone of the interior.

b. Reproducing five million impressions per month of multicolor, close register work, working two shifts per day with long-run work.

c. Performing organizational maintenance on all mechanical equipment and third echelon maintenance on engineer photographic and reproduction equipment.

131. Company Headquarters

The company headquarters is the command element of the company and includes operations personnel and maintenance personnel to maintain the mechanical and engineer photographic and reproduction equipment. It also contains personnel to maintain assigned facilities. The reproduction equipment set is located in the company headquarters.

132. Reproduction Platoons

Two platoons provide the personnel to operate the reproduction equipment located in company headquarters. Each platoon is organized with a platoon headquarters, a photographic section, a plate and layout section, and a press and finishing section.

Section VI. ENGINEER BASE MAP DEPOT COMPANY

133. Mission

This company provides personnel and facilities for bulk receipt, storage, and distribution of maps, geodetic control data, gazetteers,

a. Providing map stockage for one army group.

b. Stocking an average of five million maps and handling 450,000 maps a day.

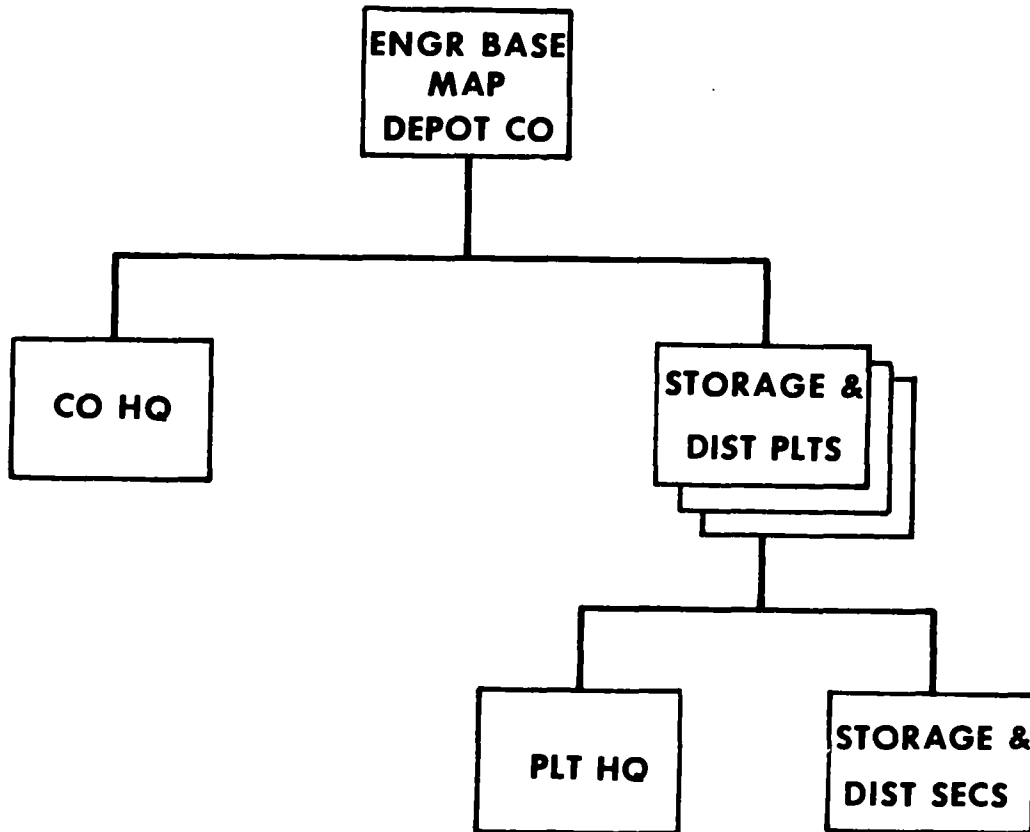


Figure 25. Engineer base map depot company.

aerial photographs, trig lists, and intelligence documents to support one army group. The organization of the company is shown in figure 25.

134. Assignment

This company is attached or assigned to an engineer base topographic battalion.

135. Mobility

This company is approximately 60 percent mobile and 100 percent air transportable in USAF aircraft.

136. Capabilities

At full strength this unit is capable of —

c. Receiving, classifying, and storing maps and mapping material.

d. Packaging and preparing maps and related intelligence materials for shipment to forward depots.

e. Each map storage platoon can operate a forward map depot with a 150,000 map/day capability.

137. Company Headquarters

The company headquarters contains the necessary personnel and facilities by which the company commander exercises command control and coordination of training programs and mission activities of the company. It provides

mess facilities for organic personnel and performs organizational maintenance on arms, vehicles and other organic equipment. The engineer supply specialist provides the knowledge required to assure that the proper engineer items are on hand.

138. Storage and Distribution Platoons

a. Three platoon headquarters provide personnel and equipment required for supervision and assistance in the receipt, storage and distribution of maps and related material. It contains the platoon leader and a platoon sergeant for command supervision of platoon ac-

tivities and contains requisitioning, stock-accounting, and control personnel.

b. Three storage and distribution sections provide the personnel and equipment for handling maps and related material. The sections are organized into receiving, storage, and shipping subsections.

c. Each platoon can operate an ADLOG map depot capable of providing bulk map support of approximately 150,000 maps/day to a field army depot. The base depot capabilities will be reduced by the number of platoons assigned to operate ADLOG depots.

Section VII. TACTICAL OPERATIONS

139. General

The engineer base topographic battalion is responsible for its own local security and should be prepared to fight in self-defense. For this purpose, the battalion and its assigned companies are armed with individual weapons (the carbine, rifle, and pistol). However, the battalion and its assigned companies, the engineer base survey photomapping, reproduction, and map depot companies are designated Category III units. When the battalion or some of its companies are attached to a field army or independent corps, their armament is augmented by 7.62-mm machineguns and rocket launchers. In an emergency, such as a breakthrough, the battalion or its companies may be called upon to fight as infantry in a general defense or retrograde movement. For the above reasons, all battalion personnel receive basic combat training, and selected personnel should receive weapons training in the use of machineguns and rocket launchers. A reorganization for combat plan should be prepared for the battalion and its assigned companies and used during all combat training exercises.

140. Reorganization for Combat

A typical reorganization for combat of the engineer topographic battalion, army, is described in Appendix III which gives a tabulation of both combat and normal position titles and assignments of the engineer topographic battalion, army, and its assigned companies.

The engineer base topographic battalion may adopt this type of reorganization for combat or one similar to it when preparing a suitable reorganization for combat to fit its particular need. A typical reorganization for combat is as follows:

a. The battalion should be divided into two echelons—combat or forward echelon, security or rear echelon.

b. The combat echelon consists of a battalion headquarters and a rifle company for each of the assigned or attached survey, photomapping, reproduction, and map depot companies.

(1) Battalion headquarters consists of command, administrative, communications, operations-intelligence, and ammunition sections.

(2) The survey, photomapping, reproduction, and map depot companies each consist of a company headquarters, a weapons section (when machineguns and rocket launchers are made available), and rifle platoons utilizing the platoons of the base companies.

c. The security echelon consists of administrative and maintenance personnel not included in the combat echelon. The security echelon is responsible for local security of bivouac and working areas, firefighting, damage control, preparation and distribution of hot meals, and the preparation of equipment for evacuation in

the event the bivouac and working areas become untenable.

d. Local defense headquarters provides telephone nets to battalion and company command posts. Companies provide messenger service to their platoons.

141. Defensive Measures

Paragraphs 94 through 97 discuss the defensive measures that should be employed against ground attack, aerial bombing and strafing, chemical attack, and nuclear or radiological attack. Paragraph 98 discusses the measures to be taken during an evacuation.

CHAPTER 8

ENGINEER TOPOGRAPHIC TEAMS

142. General

a. TOE 5-500D provides small units of highly qualified technical personnel and equipment of platoon or team size for special purpose missions or for augmentation of regular engineer topographic units.

b. Augmentation units comprise the bulk of the platoons and teams and are used for the purpose of augmenting the topographic potentials of the regular engineer topographic units. For example, the attachment of a map reproduction platoon to the engineer base reproduction company permits the company to operate on a three-shift per day basis instead of two.

143. Survey Team IA

a. This team performs second-order astro-nomic position and azimuth observations; topo-graphic surveys by means of plane table and theodolite, to include triangulation by quadri-laterals; triangulation reconnaissance, and electronic distance measuring.

b. The survey team provides technically qualified personnel and equipment for the survey operations of one party. The team is capable of performing any military survey function and is usually employed on a short term basis to augment the topographic survey potential of larger units when their survey mission is not large enough to warrant the assignment of additional survey platoons or companies. This team is designed for assignment to an engineer brigade, to a task force or to corps, army, or theater topographic units requiring a one-team augmentation to TOE engineer artillery survey capability. Transportation of the team is sufficient for its operations and movement. It requires full support from the units to which assigned or attached for supply, communica-tions, maintenance, food service, administra-tion, and medical service.

144. Photomapping Platoon IC

The photomapping platoon provides tech-nically qualified personnel and equipment for the preparation of topographic maps by mul-

tiplex methods from aerial photographs. The platoon is normally attached to the engineer base or army topographic battalion when mapping operations require additional effort less than a base photomapping company. The platoon requires support similar to that de-scribed in paragraph 143.

145. Map Reproduction Platoon ID

The map reproduction platoon provides tech-nically qualified personnel and equipment for the production of maps from original manu-scripts and limited quantities of photostats. The platoon is similar to the map reproduction platoon of the engineer base reproduction com-pany. The platoon is attached to the engineer base map reproduction company when map-ping operations require additional effort less than a base map reproduction company. The platoon requires support similar to that de-scribed in paragraph 143.

146. Map Depot Platoon IE

The map depot platoon provides technically qualified personnel and equipment for the re-ceipt, storage, issue, and distribution of maps of a base, army, or corps headquarters. The platoon is similar to the storage platoon of the engineer base map depot company. Platoons may operate as a depot. Usually three platoons are attached to each army topographic batta-lion for forward depots. The platoon requires support similar to that described in paragraph 143.

147. Relief Mapmaking Team IF

The relief mapmaking team provides tech-nically qualified personnel and equipment to construct original terrain models at scales from 1:5,000 through 1:50,000 and produce quan-tities of plastic reproductions at these scales. Normal allocation is one team per engineer base topographic battalion. The unit is not or-ganically mobile and requires full administra-tive support of the topographic unit to which attached. See TM 5-231 for technical details.

148. Geodetic Survey Team IJ

The geodetic survey team provides technically qualified personnel and equipment for high order geodetic surveys and computations for guided missiles. Normal allocation is one team per field army, attached to the engineer army topographic battalion for administrative support.

149. Terrain Team IK

The terrain team provides technically qualified personnel and equipment for the overt collection, evaluation, and dissemination of terrain data; the production of terrain studies,

and provision of consultant services in military geology and military hydrology. Normal allocation is one team per army but may be assigned at a lower level. The team requires administrative support from the unit to which attached.

150. Photographic Evaluation Team IL

The photographic evaluation team provides technically qualified personnel and equipment for evaluating aerial photography for mapping and charting purposes. The team normally is attached to a local unit for administrative support (par. 110).

CHAPTER 9

COORDINATING TOPOGRAPHIC SERVICES

151. General

Liaison between the responsible mapping staff and the major tactical elements of the command should be close and continuous. Liaison between the engineer staff and the Air Force is on the basis of joint responsibility for a common undertaking; liaison between the engineer staff and the using arms is on the basis of the supplier and the consumer.

152. Coordination With the Air Force

The Air Force is responsible for conducting aerial mapping photography. In a theater of operations, the production of aerial photography is coordinated by G2 air. Liaison with photographic aviation is established by the assignment of an engineer photo evaluation team to the photographic organization charged with the general photographic task. This evaluation team insures that aerial photography meets the established specifications as closely as operational conditions permit. The evaluation team has the authority to accept or reject aerial cartographic photography.

153. Coordination With Other Arms and Services

a. Liaison between engineer staffs and the artillery is maintained on both the planning and operation level to insure a mutual understanding of the joint mapping and ground

control problem and to obtain a suitable working agreement for its solution.

b. Other arms and services, particularly when preparing for special operations such as amphibious or airborne operations, have special mapping problems that call for liaison and close coordination once requirements are validated by G2. Liaison between the mapmaker and the consumer is always an essential function of the engineer staff.

c. Liaison with the Navy and Air Force when joint operations are involved is also essential to insure that adequate contact and exchanges of map and chart data are maintained and that photographic and cartographic missions are coordinated.

154. Liaison With Adjacent Units

Liaison between adjacent units at all levels is as important in mapping as it is in tactical operations. Army and corps engineer staffs require mapping contacts in all directions. Their commands do not operate in isolated compartments; sector boundaries change and tactical units are transferred as the tactical situation changes. Lateral liaison is as important as liaison in depth to permit lateral extension of control, reinforcement of production capacity for peak loads, and the exchange of information obtained from captured maps, documents, or prisoners.

CHAPTER 10

TRAINING

Section I. GENERAL

155. Training Objectives

a. The training of an engineer topographic unit has, as its ultimate objective, the development of individual and team skills to a degree necessary to enable the unit to accomplish its primary mission of providing maps and engineer survey information and to function as a part of the army team.

b. Basic combat and advanced individual training, and basic and advanced unit training are conducted in the unit as prescribed by appropriate army training programs (ATP's).

156. Training Doctrine

Training doctrines and principles governing all units of the army are contained in FM 21-5 and FM 21-6.

157. Training Phases

Training of engineer topographic units advances by phases. Training prescribed by army training programs is phased progressively as cadre training, basic combat training, advanced individual training, basic unit training, advanced unit training. This is followed by post-cycle training which includes modified pre-

scribed training, retraining, training individuals in related or higher MOS's, specialized unit training, and field exercises as required.

158. Combined Training

The integration of topographic teams, platoons, companies, and battalions into unified army teams is accomplished during basic and advanced unit training. Whenever possible field army topographic units should participate in field exercises and maneuvers which apply technical and logistical procedures and doctrine to simulated combat situations. Training between artillery survey personnel and topographic engineers, particularly those of corps companies, should be conducted whenever possible.

159. Schools

Unit schools are established to bridge the gap between instruction offered at the formal schools and instruction obtained from on-the-job training. They are established for specialist training of personnel who have not been school trained or who need refresher courses. These schools are conducted during the second period of advanced individual training.

Section II. ARMY TRAINING PROGRAM

160. General

a. The training program for a newly activated engineer topographic unit is prescribed in appropriate ATP's. The ATP's cover all phases of training from the time the cadre assembles and the untrained individuals enter the organization to the readiness of the company for company operations.

b. The training of engineer topographic units is similar for cadre, basic combat, and for portions of advanced individual and basic unit training which are common to all personnel of the units. Training differs for advanced unit training for certain portions of the advanced individual training phase which relate to MOS,

officer, and NCO training; and for certain portions of the basic unit training phase which relate to section, platoon, and company training.

161. Cadre Training

At the discretion of the unit commander, NCO's not required in conducting the training of the unit and/or selected personnel in need of training above the level of the training conducted for the unit may be provided advanced level instruction by substituting the training shown in ATP 21-160 (Cadre Training), or portions thereof, for training during the unit training phase. This training period is used to test the proficiency of the cadre and

make corrections; review the employment duties, and TOE of the engineer topographic unit; refresh the cadre in basic military and engineer subjects; review training methods, check post facilities for training aids and areas; and conduct organizational and administrative duties.

162. Basic Combat Training

a. Basic combat training covers the first eight weeks of training. During this training phase the recruit receives indoctrination training and instruction in basic combat skills and individual weapons which transform the untrained individual into a basic soldier.

b. An outline of subjects and hours to be devoted to this phase of training is given in sections I and II of appropriate ATP's.

163. Advanced Individual Training

a. The advanced individual training phase covers 10 weeks for corps and army topographic units and 8-10 weeks for base topographic units. The first period consists of common training and the second period of specialized training. Units may receive partially trained fillers which may permit omission of basic combat training and shortening of advanced individual training phase. The phase also includes schools for officers and noncommissioned officers.

b. During the first period of advanced individual training, the basic soldier skills of the engineer soldier are developed. The indoctrination process is continued during this period of training.

c. During the second period of advanced individual training, the engineer soldier takes the unit functional (MOS) training which is devoted to the development of the basic engineer soldier into a specialist. The training is still on an individual basis and is designed to fit the soldier into a definite place in his unit.

d. Officer and NCO training is carried on during this phase of individual training to develop ability and knowledge in job management, administration, supply, maintenance, and leadership.

164. Basic Unit Training

a. Basic unit training covers a period of 7

weeks for corps, army, and base topographic units, and is designed to provide team training whereby individual engineer soldiers are welded into effective sections and platoons.

b. All units receive common training in drill, inspections, tactical combat principles, engineer topographic unit orientation, and administrative and tactical movements.

c. Battalion headquarters sections and company headquarters perform on-the-job training.

d. The survey, photomapping, reproduction, and map distribution or depot platoons perform the actual operational functions for which they are designed.

e. Common training and unit operations are continuous, integrating the section and platoon teams into efficient companies; the headquarters and headquarters company and the lettered companies into a functioning engineer topographic battalion.

f. Battalion and component company headquarters supervise and coordinate the work of the units during this training phase with the objective of achieving overall operating efficiency.

g. Training during this phase is conducted under conditions requiring night and dual shift operations. Tactical problems including security in bivouac, equipment, and supplies are introduced.

h. The last week of basic unit training for all units is devoted to unit training tests.

165. Training Tests

a. Each engineer soldier and engineer topographic unit for which a training test exists, in addition to being tested during the training test cycle, will be tested again at such times as may be prescribed, including at the completion of the initial training cycle. As a minimum requirement, each unit will be tested at least once a year.

b. The training test for the engineer topographic battalion, army, usually consists of a move with all men and equipment at least 20 miles and the accomplishment of appropriate work projects on a two-shift basis under simu-

lated tactical conditions, 16 to 20 hours per day. The test usually includes necessary advance reconnaissance; motor movement of personnel and equipment to a tactical bivouac; provision for local security; occupation, organization, and evacuation of bivouac; a work project requiring 40 to 60 hours to complete, with available equipment and may include such tasks as astronomic determination of a position, a third order 6-mile closed traverse, a plane table sketch of the bivouac area, a semi-controlled mosaic, a black and white planimetric revision overlay, black and white line maps on transparent material from photomaps, the reproduction of a semicontrolled mo-

saic as a photomap, the reproduction of several 7½-minute quadrangles, the establishment of a map distribution center, with related planning, supervision, administration, communication, liaison, and supply to include establishment of a water point.

c. The training test for the engineer topographic company, corps, is similar to that of the engineer topographic battalion, except on a smaller scale. Base survey, photomapping, reproduction, and depot companies of the engineer base topographic battalion usually are tested individually by companies under similar simulated situations.

Section III. POSTCYCLE TRAINING

166. General

a. Postcycle training continues the initial army training program cycle of the engineer soldier and his unit in order to maintain and perfect that training. It is the period during which deficiencies are corrected in individuals and units, and in which qualified individuals and units are given specialized training in related fields.

b. No specific number of weeks is prescribed for the postcycle training period. In determining the exact length of the postcycle training period for engineer topographic units, consideration should be given to the probable date the unit will be sent on operational missions.

167. Retraining

a. Individuals found deficient in their primary MOS as a result of observation or tests are retrained until a proper standard is attained or are assigned a new primary MOS appropriate to their abilities and qualifications.

b. Engineer topographic units found deficient as a result of tests in any phase of training are retrained until a proper standard is attained.

c. Units which have undergone a large turnover of personnel may have to retrain completely under the prescribed ATP.

d. Major engineer commanders may exercise their own judgment in requiring engineer units to retrain completely under the prescribed

ATP, or to undergo modified training.

168. Filler Replacements

All filler replacements received by the engineer topographic units after the completion of unit training, who have not undergone advanced individual training, should be qualified in general engineering subjects. The unit commander is responsible for the training of these filler replacements. Where a replacement has had civilian experience in a related field, he may require only a short period of orientation. Practical tests should be given to replacements who claim prior civilian experience in a specialist job before they are assigned, to determine the extent of their knowledge and skill. Replacements should be grouped in special classes or, where the number is small, receive special individual instruction. This training should be in addition to their MOS on-the-job training.

169. Substandard Personnel

A portion of the personnel in topographic units will not be able to advance beyond basic skills. When this is due to lack of intelligence or adaptability, a special training should be given these men. Care should be taken to place such individuals in positions in the unit suitable to their capabilities. Some men will require intensive training, conducted at a slow pace, in special classes. Instructors chosen to train these men should be selected for their

patience and ability to present facts in a clear and simple manner. Substandard personnel are often dependable and efficient workers if properly trained and assigned to jobs within their capabilities.

170. Instructor Training

a. The engineer topographic unit commander should evaluate the instructional ability of his personnel and continually emphasize and conduct instructor training.

b. Battle losses, sickness, levies, and other

causes will deplete engineer units. The training of filler replacements (par. 168) becomes a continuous process. The unit should become and remain adept at training replacements to take their places in the organization.

c. Instructor training begins at the battalion level. Special classes are conducted for battalion officers. They, in turn, conduct courses for all officers and key training personnel of the battalion to indoctrinate them thoroughly in the subjects and training methods involved.

APPENDIX I

REFERENCES

1. Special Regulations (SR) and DA Pamphlets

DA Pam 310	Indexes of Military Publications.
Series	
SR 310-30-1	Equipment Authorization Tables.

2. Army Regulations (AR)

117-5	Mapping and Surveying.
320-5	Dictionary of U.S. Army Terms.
320-50	Military Terms, Abbreviations and Symbols.
380-5	Safeguarding Military Information.
750-5	Maintenance of Supplies and Equipment.

3. Field Manuals (FM)

3-5	Chemical, Biological, and Radiological (CBR) Operations.
3-8	Chemical Corps Reference Handbook.
3-10	Chemical and Biological Weapons Employment.
3-12	Operational Aspects of Radiological Defense.
3-210	Fallout Prediction.
5-1	Engineer Troop Organizations and Operations.
5-20	Camouflage, Basic Principles and Field Camouflage.
5-36	Route Reconnaissance and Classification.
5-135	Engineer Battalion, Armored Mechanized, and Infantry Divisions.
6-2	Artillery Survey.
6-20-1	Field Artillery Tactics.
6-20-2	Field Artillery Techniques.
6-37 (C)	Field Artillery Missile Battalion SERGEANT (U).
6-120	The Field Artillery Target Acquisition Battalion and Batteries.
6-121	Field Artillery Target Acquisition.
7-11	Rifle Company, Infantry, Airborne Infantry and Mechanized Infantry.
7-15	Infantry, Airborne Infantry, and Mechanized Infantry, Rifle Platoons and Squads.
7-20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
7-30	Infantry, Airborne, and Mechanized Division Brigades.
20-32	Land Mine Warfare.
21-5	Military Training.
21-6	Techniques of Military Instruction.
21-26	Map Reading.
21-30	Military Symbols.
21-31	Topographic Symbols.
21-40	Small Unit Procedures in Chemical, Biological and Radiological Warfare.
25-10	Motor Transportation, Operations.
31-25	Desert Operations.
31-30	Jungle Operations.
31-70	Basic Cold Weather Manual.
100-5	Field Service Regulations Operations.
100-10	Field Service Regulations Administration.

101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
101-10	Organization, Technical, and Logistical Data.

4. Technical Manuals (TM)

5-230	General Drafting.
5-231	Mapping Functions of the Corps of Engineers.
5-232	Elements of Surveying.
5-233	Construction Surveying.
5-235	Special Surveys.
5-236	Surveying Tables.
5-239	Military High Precision Stereoplotter.
5-240	Map Compilation, Color Separation, and Revision.
5-241-1	Grids and Grids References.
5-241-8	Universal Transverse Mercator Grid.
5-243	Cartographic Aerial Photography.
5-244	Multiplex Mapping.
5-245	Map Reproduction.
5-248	Foreign Maps.
5-441	Topographic Surveying.
5-6000 to 5-6054	Reproduction Equipment, Technical Manuals Issued with TOE Equipment.
9-2810	Tactical Motor Vehicle Inspection and Preventive Maintenance Services.
21-305	Driver's Manual.
30-245	Photographic Interpretation Handbook.
30-246	Tactical Interpretation of Air Photos.
30-252	Photographic Interpretation Manual — Photographic Metrics.
38-660-1	Preventive Maintenance of Administrative Vehicles.

5. Army Training Programs (ATP)

21-114	Basic Combat Training Program for Male Military Personnel Without Prior Service.
--------	--

6. Tables of Organization and Equipment (TOE)

5-305	Engineer Topographic Battalion, Army.
5-327	Engineer Topographic Company, Corps.
5-344	Engineer Base Map Depot Company.
5-346	Headquarters and Headquarters Detachment, Engineer Base Topographic.
5-347	Engineer Base Reproduction Company.
5-348	Engineer Base Survey Company.
5-349	Engineer Base Photomapping Company.
5-500	Engineer Service Organization, Part 7, Topographic Teams.

APPENDIX II

TYPICAL SOP FOR AN ENGINEER TOPOGRAPHIC BATTALION

To be used as a guide for the preparation of an SOP for the Engineer Topographic Battalion.

HEADQUARTERS ENGINEER TOPOGRAPHIC BATTALION STANDING OPERATING PROCEDURE

(DATE) 7-1

1. GENERAL

a. References. SOP's and training memoranda of Engineer Section, and Engineer Topographic Battalion; AR's, SR's, FM's, and TM's.

b. Effective. At once.

2. COMMAND

a. Command Posts. Companies will report change of command post location immediately.

b. Liaison.

(1) Battalion headquarters will maintain liaison with detached elements.

(2) Companies and platoons will maintain liaison with supported units.

c. Signal Communications.

(1) General. Current SOI will govern.

(2) Messengers. Each company will furnish one messenger to battalion CP upon moving to new bivouac areas; messenger to be relieved as soon as telephone communication established.

(3) Wire installation. On order this headquarters, H&H company will furnish detail of three men to assist Signal Corps in laying telephone wire to each company.

(4) Signal security. Code converters and simple special codes will be used for security of messages within battalion; messages will be authenticated.

3. ADMINISTRATION

a. Unit Journal. Detailed reports of activity for battalion journal will be furnished adjutant daily by all companies and staff sections 24-hour period ending preceding midnight.

b. Replacements. Thorough orientation of replacements, especially mission and history of battalion.

c. Unit Funds. Unit funds will be closed out last day of each month; submitted to executive officer for audit by fifth day of succeeding month.

d. Leave. Officers and men of battalion will receive same amount of leave time at rest centers.

e. Evacuation.

(1) Patients will be evacuated to nearest medical installation.

(2) Battalion aid station will be located near battalion CP.

f. Daily Strength Returns. Companies will submit daily strength returns as of 2400 to message center by 0900 to be turned over to adjutant, who will submit consolidated daily strength return to engineer section headquarters by 1100.

g. Mail.

- (1) Outgoing mail will be censored and delivered by companies to battalion mail clerk promptly.
- (2) Battalion mail clerk will deliver incoming mail to companies by most expeditious means.

h. Quartermen Party.

- (1) Quartermen detail will consist of two men per company. Assigned personnel will report to adjutant before movement of battalion.
- (2) Each company detail will carry company signs, tracing tape, flashlights, wire cutters, and one mine detector.
- (3) H&H company will furnish one truck.

i. Wearing of the Uniform (Annex 1).

j. Schedule of Calls (Annex 2).

4. INTELLIGENCE

a. Prisoners of War.

- (1) Capturing units will disarm, search, tag and evacuate by most expeditious means to nearest prisoner of war collecting point.
- (2) Enemy officers, NCO's, privates and deserters will be separated immediately after capture.
- (3) PW will not be permitted to eat, smoke, drink, or rest prior to arrival at PW collecting point; except when such treatment would be inhumane.
- (4) Report immediately to G2 capture of enemy aircrews and guided missile, chemical, biological, and nuclear weapons personnel.

b. Captured Documents. Crypto material and documents containing information on nuclear, chemical, and biological weapons delivered to G2 immediately. Other documents through S2 except as below. All documents marked with date, time and place found or captured, including name and rank of PW. Documents found on PW will be carried by prisoner's escort to collecting point. Technical documents found with captured equipment will be kept with equipment.

c. Technical Intelligence.

- (1) Report of new or unusual enemy equipment, armament, nuclear material, or CB agents forwarded immediately to G2 with brief description. Captured or crashed enemy aircraft reported immediately to G2 and guarded by discovering unit.
- (2) Captured enemy material promptly reported by capturing unit, inspected by technical service intelligence team, and evacuated.

d. Weather. G2 obtains and disseminates weather reports.

(1) Normal weather reports will be accomplished twice daily or as deemed necessary for operations.

(2) Special reports:

(a) Forecasts for radiological defense twice daily or are broadcast as spot transmissions during intervals between forecasts.

(b) Severe weather warnings accompany two hour forecasts or are broadcast as spot transmission during intervals between forecasts.

e. Reconnaissance.

(1) General. Use flash message report for approach of enemy armor, aircraft, naval or amphibious landing craft, airborne troops, or enemy nuclear or CB attack. Include number, type, location, direction of movement, speed, altitude (if applicable), time observed, and identification of observer. For nuclear flash message report, see Annex 11, Actions to Minimize Effects of Enemy Nuclear, Chemical, and Biological Attack.

(2) Engineer.

(a) Companies and detachments will perform general engineer reconnaissance in their operating areas without orders. Such reconnaissance is a continuing function.

(b) Mapping reconnaissance will be made as directed by battalion operations section.

(3) Ground. SHELREP, and BOMREP to nearest artillery headquarters immediately.

f. Counterinfiltration. Civilians infiltrating through unit area to or from enemy occupied territory will be apprehended and turned over to counterintelligence.

g. Counterintelligence.

(1) Units check evacuated installations, bivouac and assembly areas to insure no classified or identifying material left.

(2) Pass system established in conformity with unit security plan. Control measures and guard system inspected and tested frequently.

(3) CP and directional signs use assigned code titles.

(4) Known or suspected loss or compromise of codes or other classified material will be reported immediately to S2.

(5) Communications security: Compliance with current SOI and SSI.

(6) Suspected enemy agents will be immediately reported to G2.

5. OPERATIONS

a. Reports.

(1) Companies will submit daily status of project report as of 2400 to message center by 0900, to be turned over to battalion operations officer, who will submit consolidated battalion daily status report to engineer section headquarters by 1100.

(2) Equipment, production, materials, and completion reports will be submitted as directed by battalion operations officer.

b. Security.

(1) Warning system. As prescribed by engineer section headquarters (Annex 12).

(2) Bivouac.

- (a) Companies in bivouac away from battalion will furnish bivouac security of interior guard. Outpost and patrols will be set up when situation demands.
- (b) When battalion is in bivouac, one company will be designated to furnish all bivouac security against attack by air, armored, foot troops, and CBR agents. Security company will enforce camouflage discipline; will set up during daylight, when required, guns and crews for antiaircraft defense; is authorized to obtain additional guns and crews direct from other companies when required for antiaircraft defense. Troops fire on hostile aircraft only on command of their leaders. One officer in company and one NCO in each platoon will be constantly on duty to alert company in accordance with predetermined alert plan. Vehicles will be headed toward exist, concealed, and spaced at least 50 yards apart.

(3) Motor movements.

- (a) Truck covers will be rolled during daylight to provide all-around visibility. Two air guards per truck carrying personnel, one to front and one to rear, will observe at all times.
- (b) Machineguns on antiaircraft mounts will be dispersed throughout motor column. During air attack, vehicles will continue movement; antiaircraft weapons open fire only. At night when illuminated by flares, all movement will cease, troops will keep their heads down.
- (c) At halts, troops, except antiaircraft machinegun personnel, will dismount; each motor column unit will detail sentinels to guard front, rear, and flanks.

(4) Working areas.

- (a) Close-in security habitually will be furnished by elements of battalion at working areas. Distant security will be arranged for by battalion operations officer with local defense troops and engineer section headquarters.
- (b) Officer or NCO in charge of each working area will be responsible for posting air observers and antiaircraft weapons; maintaining strict camouflage discipline; and for proper alert measures.

c. Movement.

(1) Motor movement.

- (a) Movement orders will prescribe time of departure order of march, initial point, route, objective, type of movement, halt areas, or time of halts.
- (b) For detailed loading plan and special information dependent on local theater situation see Annex 3.
- (c) Rate of march on good roads, 25 mph; night 10 mph; reduce as necessary and by order. Maximum speed, 35 mph; night 15 mph; regulate to insure rate of march for column.
- (d) Distances to be maintained — daylight, open column, minimum distance 100 yards, maximum distance 200 yards; night, closed column, minimum distance consistent with safety, maximum distance 50 yards.

- (e) Preparatory to movement, companies will form off roads and in concealment in sufficient time to pass from bivouac area to route of march without interruption or loss of distance.
- (f) Senior officer or NCO in vehicles carrying personnel is vehicle commander; he rides alongside driver; additional NCO rides the tail of truck.
- (g) See paragraph 5b(3) for security during motor movements.
- (h) See paragraph 3h for quartering party.
- (i) Strip maps for drivers.
- (2) Air movement. See Annex 4 for air movement SOP, including loading, unloading, type loads, and marshaling procedures.
- (3) Rail movement. See Annex 5 for rail movement SOP.
- (4) Water movement. See Annex 6 for water movement SOP.

d. Training Subject Sequence. See Annex 9.

e. Mapping Operations.

- (1) For reports required see paragraph 5a.
- (2) Directives from this and engineer section headquarters will be strictly enforced. Battalion executive officer will insure compliance for their enforcement.
- (3) Battalion operations section will be responsible for compliance with plans and specifications. No modifications or changes in plans and specifications will be undertaken by companies unless approved by battalion operations officer, who in turn will obtain engineer section headquarters approval.
- (4) Allocation of specialized topographic and reproduction equipment will be made by battalion operations officer to companies. Companies will submit request to battalion operations officer for additional equipment needed. Battalion maintenance officer will keep battalion operations officer informed of improper use of equipment.
- (5) Two-shift operations will be normal for the battalion with the exception of survey units. Survey units will work as required, depending on field conditions.
- (6) Battalion operations officer will be responsible for strict observance of blackout regulations. Companies will be responsible that their blackout equipment is in working order so as not to hinder operations.
- (7) Technical inspections by staff personnel will determine quality and completeness of work and proper use of equipment. During technical inspections, staff personnel will check to see whether companies and detachments are maintaining scheduled progress; equipment is properly allocated to maintain maximum output; supplies, especially critical items are on hand to prevent work stoppage; proper methods are being used; and that job specifications are being followed.
- (8) Command inspections will be made by battalion, company, and platoon commanders, or their designated representatives, to check the efficiency of personnel; to insure that subordinate commanders are complying with prescribed directives; to determine if equipment is efficiently assigned; and to correct unsatisfactory conditions and eliminate bottlenecks.

f. Reorganization for Combat. For detailed reorganization for combat see Annex 10. (Battalion reorganization for combat is described in Appendix III.)

6. SUPPLY

a. Class I.

- (1) Companies will pick up rations from battalion general supply subsection.
- (2) One reserve ration per individual will be carried at all times on kitchen vehicles to be consumed only on order of an officer.
- (3) Daily strength returns for determining ration pickup will be obtained from adjutant (par. 3f).

b. Classes II and IV. Companies will submit informal request to battalion supply section.

c. Class III.

- (1) Companies will establish refueling and servicing schedules for gasoline, oil, and grease for engineer equipment and vehicles in work areas.
- (2) Companies will draw gasoline, oil, and grease at battalion DP, H&S company area.

d. Class V.

- (1) Companies will submit ammunition expenditure reports as of 2400 to battalion supply officer by 0900 daily.
- (2) Battalion supply section will distribute ammunition directly to companies.

e. Water. All water drawn from any source other than established water points will be chlorinated.

f. Salvage. Evacuate all salvage to battalion supply dump in H&H company area.

g. Procurement by Detached Elements.

- (1) All supplies, except engineer, will be procured from unit to which attached.
- (2) Engineer supplies will be procured from battalion supply section.

h. Supply Economy.

- (1) Company and detachment commanders will take positive action to insure that their commands practice supply economy at all times.
- (2) All members of the battalion will receive constant indoctrination in their responsibilities for proper use of equipment, economy in the use of supplies, and prevention of pilferage.

7. MOTOR POOL OPERATIONS (Annex 7).

8. EQUIPMENT MAINTENANCE (Annex 8).

OFFICIAL:

By command of Lt. Col. A.

Capt Engr Topo Bn
Adjutant.

/s/B

/t/B

Capt Engr Topo Bn
Adjutant

ANNEXES:

1. Wearing of the uniform (omitted)
2. Schedule of calls (omitted)
3. Motor movement loading plan (omitted)
4. Air movement (omitted)
5. Rail movement (omitted)
6. Water movement (omitted)
7. Motor pool operations (omitted)
8. Equipment maintenance (omitted)
9. Training subject sequence
10. Reorganization for combat (Appendix III, this manual)

DISTRIBUTION:

APPENDIX III

SOP ANNEX 10. REORGANIZATION FOR COMBAT

To be used as a guide for the preparation of an SOP annex for reorganization for combat, to an SOP for the Engineer Topographic Battalion, Army.

HEADQUARTERS ENGINEER
TOPOGRAPHIC BATTALION
STANDING OPERATING PROCEDURE
ANNEX 10
REORGANIZATION FOR COMBAT

(Date)

1. PURPOSE

The purpose of reorganizing the battalion for combat is to prepare the battalion for defense of its bivouac and working areas against enemy attack and to fight as infantrymen when required.

2. REFERENCES

SOP's and training memoranda of Engineer Section, and Engineer Topographic Battalion; FM 7-10, FM 7-15, and FM 7-20.

3. ALERT

This reorganization plan becomes effective upon receipt of alert from battalion headquarters. See Annex 11, operation plan for defense of construction site.

4. COMPANY SOP's

Companies will prepare company SOP's based on this SOP to establish specific duties for all personnel in their organization.

5. ORGANIZATION INTO ECHELONS

The battalion will be reorganized into two echelons: combat or forward echelon, and security or rear echelon.

a. The combat echelon will consist of battalion headquarters and three rifle companies.

b. The security echelon will consist of administrative and maintenance personnel not included in the combat echelon.

c. Tables I, II, and III show the assignment of battalion headquarters, H&H company, and the engineer photomapping company personnel to the reorganized units. The engineer map reproduction and distribution company will be organized similar to that of the engineer photomapping company. Both combat and normal position titles and assignments are shown in the tables.

6. BATTALION COMBAT HEADQUARTERS

Battalion combat headquarters will consist of a command section, an administrative section, a communications section, an operations-intelligence section, and an ammunition section. See Table I for breakdown.

7. H&H COMPANY COMBAT ECHELON

H&H company combat echelon will be organized into a company headquarters, a weapons section of three weapons squads, and one rifle platoon consisting of two sections of three rifle squads each. See Table II for breakdown.

8. ENGINEER PHOTOMAPPING COMPANY COMBAT ECHELON

Each of the organic companies will be organized into a company headquarters, a weapons section of two weapons squads, and two identical rifle platoons each consisting of two sections of two rifle squads each. See Table III for breakdown.

9. WEAPONS SQUADS

a. Each organic company headquarters will be assigned a weapons section of two weapons squads, one weapons squad on the basis of one rocket launcher and one cal. .50 machinegun, and the second squad on the basis of one rocket launcher.

b. H&H company headquarters will be assigned a weapons section of three weapons squads; two weapons squads on the basis of one rocket launcher and one cal. .50 machinegun, the third squad on the basis of one rocket launcher.

c. Assignment of weapons squads to company headquarters will provide firepower for the support of its platoons, and for defense of battalion and company headquarters and bivouac and working areas.

10. SECURITY ECHELON

a. The battalion map distribution officer will command the security echelon which will consist of all battalion security personnel. See Tables I, II, and III for breakdown.

b. Battalion supply officer and battalion maintenance warrant officer will be assigned to the security echelon.

c. The security echelon will be responsible for local security of bivouac and working areas, fire fighting, damage control, preparation and distribution of hot meals, and preparation of equipment for evacuation in event the bivouac and working areas become untenable.

11. COMMUNICATIONS

a. Battalion headquarters will provide telephone nets to company command posts.

b. Companies will provide messenger service to their platoons.

12. ENGINEER WORK AND EQUIPMENT

a. On alert, all engineer work will cease except water supply and limited supply and reconnaissance, which will be continued by the security echelon.

b. Engineer equipment will be evacuated to equipment parks designated by the commander of security echelon (battalion map distribution officer).

c. Full field equipment will be retained by individuals. All other individual equipment will be loaded by the company security echelon and stored in areas designated by the battalion supply officer.

13. SUPPLY

a. Rations and water will be furnished elements of the combat echelon by the security echelon. Mess sections will furnish hot meals when the situation permits; otherwise, combat type rations will be issued. Mess sections will also furnish water.

b. Ammunition supply will be controlled by the ammunition section of battalion headquarters. The battalion supply warrant officer, assisted by four supply specialists, will make up this section. Transportation and loading personnel for ammunition will be furnished by the security echelon and will be under the direction of the battalion supply officer. Movement of ammunition, controlled by battalion section, will be direct from rear ammunition dumps to company ammunition supply points.

c. Other supplies as needed by combat echelon will be sent forward by battalion supply officer from security echelon areas.

14. MEDICAL EVACUATION

a. Medical unit providing medical service to battalion will provide battalion surgeon and medical detachment.

b. Battalion surgeon will set up battalion aid station near battalion headquarters; supervise the operations of the medical detachment; and furnish one aid man to each company.

c. Litter bearers will be drawn from company personnel as required.

15. TRAINING

This plan will be effective during all combat training exercises.

INDEX

	Paragraphs	Page		Paragraphs	Page
Administrative and personnel:			Relation to other topographic		
Engineer topographic battalion, army	65	38	units	101	55
Engineer topographic company, corps	47	26	Reorganization for combat ..	140	65
Advanced individual training	163	71	Supply section	108	58
Advanced unit training	165	71	Tactical operation	139-141	65
Aerial bombing and strafing, defense against ..	94	52	Battalion, engineer topographic, army:		
Air Force, coordination	152	69	Administration and personnel	65	38
Armament (see also individual units):			Armament	55a	33
Engineer base topographic battalion	139	65	Assignment	57	35
Engineer topographic battalion, army	93d	52	Aviation section	75-76	45
Engineer topographic company, corps	54	33	Battalion commander	58a	35
Army training program (ATP)	155	70	Battalion headquarters (fig. 17)	60	36
Assignment (see also individual units):			(See also administration, intelligence, operations, supply, maintenance, and map distribution)		
Engineer base topographic battalion ..	36	23	Capabilities	64a	38
Engineer topographic battalion, army	57	35	Command operations	65	38
Engineer topographic company, corps	41	25	Communications	64c	38
Engineer topographic teams, general	142-150	67	Composition (fig. 16)	56	35
Atomic attack, defense against ..	97	53	Equipment	64b	38
Base topographic units (see specific unit)			Headquarters and headquarters company (fig. 17)	61	36
Basic combat training	162	71	Intelligence section	66	39
Basic unit training	164	71	Maintenance	69	41
Battalion, engineer base topographic:			Maintenance motor officer	69	41
Aviation section	109	58	Map distribution officer ..	70	42
Armament	139	65	Map supply and distribution ..	70	42
Assignment	100	55	Mission	59	35
Battalion commander	104	57	Mobility	56b	35
Battalion headquarters (fig. 21)	103	56	Operations	67	39
Capabilities	103c	56	(see also Operations)		
Command operations	104	57	Operations officer	67	39
Communications	103f	57	Photomapping company, army	62	36
Composition (fig. 20)	99	55	Relation to army command	57b	35
Defense measures	141	66	Relation to other topographic units	58	35
Equipment	103e	57	Reorganization for combat ..	55	33
Executive officer	104b	58	Supply	68	41
Liaison	110	58	(see also Supply)		
Mission	102	56	Supply officer	68	41
Mobility	99c	55	Survey platoon	73-74	43
Operations section	107	58	Tactical operations	92-98	51
Organization (fig. 20)	99	55	Training tests	165	71
Relation to theatre headquarters	100	55	Bivouacs	27	18
			Cadre training	161	70
			Camps (see Bivouacs)		
			Capabilities (see also individual units):		
			Engineer base topographic battalion ..	103c	56
			Engineer topographic battalion, army	64a	38

INDEX—Continued

	Paragraphs	Page		Paragraphs	Page
Engineer topographic company, corps	48	27	Ground attack	94	52
Engineer topographic units, general	38	24	Nuclear biological or radiological attack	97	53
Chemical attack, defense against	96	53	Defense plan	31c	20
Climate	29	18	Depot, map (see Map depot)		
Combat, reorganization for	31, 93, 140	20, 51, 65	Desert conditions	29b	19
	App III	83	Destruction of maps	21e	17
Combat training, basic	162	71	Doctrine, training	156	70
Combined training	158	70	Engineer base topographic battalion. (see battalion, base)		
Commander, battalion	65	38	Engineer base topographic companies. (see individual units)		
Communications (see also individual units):			Engineer map reproduction and distribution company, army. (see Map reproduction and distribution company, army)		
Engineer base topographic battalion	103f	57	Engineer photomapping company, army, (see Photomapping company)		
Engineer topographic battalion, army	64c	38	Engineer platoon (see specific platoon)		
Engineer topographic company, corps	47	26	Engineer topographic and intelligence teams (see Teams)		
Company, engineer topographic corps:			Engineer topographic battalion, army (see Battalion, army)		
Administration	47	26	Engineer topographic company, corps (see Company, corps)		
Armament	54	33	Engineer topographic units, general:		
Aviation section	52	33	Assignment	36	23
Capabilities	48	27	Capabilities	38	24
Cartographic platoon	50	32	Counterinsurgency role	32-33	20
Composition	40	25	Employment	37	23
Command operations	45	26	Mission	34	23
Communications	47b	26	Mobility	39	24
Company headquarters	44	26	Topographic support in a theatre of operations	35	23
Equipment	48b	27	Equipment:		
Map distribution operations	47	26	Engineer base map depot company	138b	65
Mess operations	44b	26	Engineer base photomapping company	115	60
Mission	43	26	Engineer base reproduction company	131	63
Mobility	39a	24	Engineer base survey company	121	61
Operations section	45	26	Engineer base topographic battalion	103e	57
Organization (fig. 9)	40	25	Engineer map reproduction and distribution company, army	87b	49
Relation to corps command	41	25	Engineer photomapping company, army	81d	46
Relation to other topographic units	42	25	Engineer topographic battalion, army	64b	38
Reorganization for combat	55	33	Engineer topographic company, corps	48b	27
Reproduction platoon	51	33			
Supply and maintenance operations	44b	26			
Survey platoon	49	32			
Tactical operations	53-55	33			
Technical operations	48-52	27			
Control:					
Map production	6, 9	2, 9			
Schedules	20	13			
Reports	20b, c	14			
Coordinating topographic services	151-154	69			
Corps topographic company. (see Company, Corps)					
Counterinsurgency	32-33	20			
Defense against:					
Aerial bombing and strafing	95	53			
Chemical attack	96	53			

INDEX—Continued

	Paragraphs	Page		Paragraphs	Page
Headquarters and headquarters company, army	72	43	Mobility	56b	35
Map reproduction garrison layout (fig. 15)	48b	27	Organization (fig. 17)	60	36
Map reproduction layout train (fig. 14)	48b	27	Supply	68	41
Mobile camera unit (fig. 11)	48b	27	Survey platoon	73-74	43
Mobile plate processing unit (fig. 12)	48b	27	Tactical operations	77	46
Mobile press unit (fig. 10)	48b	27	Housing	28	18
Mobile van expanded (fig. 13)	48b	27	Individual training, advanced	163	71
Evacuation	98	53	Inspections	20	13
Executive officer, battalion	104b	58	Instructor training	170	73
Filler replacements	168	72	Intelligence	66	39
Geodetic control	7a	3	Jungle conditions	29a	18
Geodetic survey team (IJ)	143	67	Layout for map depot (fig. 6)	21c	14
Ground attack, defense against	94	52	Layout for map reproduction train (fig. 14, 15)	48b	27
Guerrilla operations:			Liaison with:		
Counterinsurgency	32	20	Air Force	152	69
Engineer roles	33	20	Other arms and services	153	69
Guerrilla warfare	32	20	Adjacent units	154	69
Headquarters:			Local security	31b, 92	20, 51
Engineer base map depot company	137	64	Maintenance:		
Engineer base photomapping company	115	60	Engineer topographic battalion, army	69	41
Engineer base reproduction company	131	63	Maintenance section chief ..	69	41
Engineer base survey company	122	61	Operating procedures	69e	42
Engineer base topographic battalion	103	56	Topographic maintenance	24	18
Engineer map reproduction and distribution company, army	71	43	Map compilation ..	7b	5
Engineer photomapping company, army	81	46	Map depot company, engineer base:		
Engineer topographic battalion, army	60	36	Armament	139	65
Engineer topographic company, corps	44	26	Assignment	134	64
Headquarters and headquarters company	61	36	Capabilities	136	64
Headquarters and headquarters company, engineer topographic battalion, army:			Company headquarters	137	64
Armament	93d	52	Equipment	138b	65
Assignment	57	35	Mission	133	64
Aviation section	75-76	45	Mobility	135	64
Capabilities	72	43	Organization (fig. 25)	133	64
Communications	64c	38	Storage and distribution platoons	138	65
Company headquarters	61	36	Tactical operations	139	65
Company operations	65-67	38	Map depot operations:		
Equipment	64b	38	Depot operations	21a, d	14, 17
Maintenance	69	41	Destruction of maps	21e	17
Mission	71	43	Layout and site location (fig. 6)	21b, c	14
			Map depot platoon (IE)	146	67
			Map distribution officer	70	42
			Map distribution planning	18e	12
			Map distribution platoon, engineer map reproduction and distribution company, army	90-91	50
			Map distribution section, engineer topographic company, corps	47	26
			Mapping material	7	2
			Mapping program, development ..	8	8
			Map production capacities	17	11
			Map production control	6	2

INDEX—Continued

	Paragraphs	Page		Paragraphs	Page
Map production phases	15	10	Mobile plate processing unit (fig. 12)	48b	27
(see also individual phases)			Mobile press unit (fig. 10)	48b	27
Map production planning and operations	9-21	9	Mobility (see also individual unit):		
(see also Operations)			Engineer base topographic battalion	39c	24
Map reproduction and distribution company, engineer, army:			Engineer topographic battalion, army	39c	24
Armament	93d	52	Engineer topographic company, corps	39a	24
Capabilities	87	48	Motor movements	App. II	76
Command operations	87c	49	Operations (see also specific units II:		
Communications	93f	52	Battalion operations, army	67	39
Company headquarters	86	48	Climate	29	18
Equipment	87b	49	Cold weather conditions extreme	29c	19
Map distribution platoon	90-91	50	Company operations, corps	44-47	26
Mission	63c	38	Control	6, 9, 67g	2, 9, 40
Mobility	63b	37	Desert conditions	29b	19
Organization (fig. 19)	63	37	Housing	28	18
Reproduction platoon	88-89	49	Inspections	20d	14
Tactical operations	92	51	Jungle conditions	29a	18
Map reproduction phase of the mapping program	7c, 15	5, 10	Liaison	151-154	69
Map reproduction platoon (ID)	145	67	Maintenance	24, 93	18, 51
Map planning supply and distribution phase mapping program	16	11	Map depot operations (fig. 6)	21c	14
Map supply and distribution planning (fig. 5)	18	12	Map productions capacities	17	11
Map supply and distribution operations, battalion	70	42	Map production phases	11	9
Mapping data, evaluation of available	12	9	Map production planning and operations	9-21	9
Mapping missions (see Missions)			Map reproduction phases	11	9
Maps, destruction of	21e	17	Map supply and distribution phase	16	11
Mission:			Map supply and distribution planning (fig. 5)	18	12
Engineer base map depot company	133	64	Motor movements	App II	76
Engineer base photomapping company	111	59	Operational methods	19	13
Engineer base survey company	117	60	Photomapping phase	14	10
Engineer base reproduction company	127	62	Power	27	18
Engineer base topographic battalion	102	56	Production capacities	17	11
Engineer map reproduction and distribution company, army	63c	38	Production phases	11	9
Engineer photomapping company, army	62c	37	Reports	20b, c	14
Engineer topographic battalion, army	59	35	Shift operations	22	17
Engineer topographic company, corps	43	26	Safeguarding military information	30	19
Engineer topographic units, general	9	9	Schedules	20a	13
Headquarters and headquarters company	59	35	Supply economy	25	18
Mobile camera unit (fig. 11) ..	48b	27	Supply, topographic	23, 68	17, 41
			Survey phase	13	9
			Tactical operations (see Tactical)		
			Topographic operations, general	34-39	23
			Water supply	26	18
			Weather (see climate)		
			Working shifts	22	17
			Operations officer, battalion	67	39

INDEX—Continued

	Paragraphs	Page		Paragraphs	Page
Organization and organization charts:			Photomapping platoons, engineering photomapping company, army	116	60
Battalion headquarters, engineer topographic battalion, army (fig. 17)	60	36	Photomapping platoon (IC)	144	67
Engineer base map depot company (fig. 25)	133	64	Platoon (see specific platoon)		
Engineer base photomapping company (fig. 22)	111	59	Postcycle training	166	72
Engineer base reproduction company (fig. 24)	127	62	Power	27	18
Engineer base survey company (fig. 23)	117	60	Production capacities	17	11
Engineer base topographic battalion (fig. 22)	99	55	Production phases of the mapping program (see also individual phases)	11	9
Engineer map reproduction and distribution company, army (fig. 19)	63	37	Radiological attack, defense against	97	53
Engineer photomapping company, army (fig. 18)	62	36	References	App. I	74
Engineer topographic battalion, army (fig. 16)	56	35	Relief mapmaking team (IF)	147	67
Engineer topographic company, corps (fig. 9)	40	25	Reorganization for combat:		
Headquarters and headquarters company, engineer topographic battalion, army (fig. 17)	61	36	Engineer base topographic battalion	140	65
Headquarters detachment, engineer base topographic battalion (fig. 21)	103	56	Engineer topographic battalion, army	93	51
Personnel and administration	71	43	Engineer topographic company, Corps	55	33
Photographic evaluation team II	150	68	Replacements, filler	168	72
Photomapping company, engineer, army:			Reproduction company, engineer base:		
Assignment	79	46	Armament	139	65
Capabilities	78	46	Assignment	128	63
Command operations	82	46	Capabilities	130	63
Company headquarters	81	46	Company headquarters	131	63
Equipment	81d	46	Equipment	131	63
Mission	62b	36	Mission	127	62
Mobility	80	46	Mobility	129	63
Operations section	82	46	Organization (fig. 24)	127	62
Organization (fig. 18)	62	36	Reproduction platoons	132	63
Photomapping platoons	83-84	47	Tactical operations	139	65
Tactical operations	85	48	Reproduction platoons, engineer base reproduction company	132	63
Photomapping company, engineer base:			Reproduction platoon, engineer map reproduction and distribution company, army	88-89	49
Assignment	112	59	Reproduction platoon, engineer topographic company, corps	51	33
Capabilities	114	60	Responsibilities (see specific commander, executive, or staff officer)		
Company headquarters	115	60	Retraining	163	71
Equipment	115	60	Schedules	20	13
Mission	111	59	Schools	159	70
Mobility	113	59	Safeguarding military information	30	19
Operations section	123	62	Shifts, working	22	17
Organization (fig. 22)	111b	59	Signal communications (see Communications)		
Photomapping phase of the mapping program	14	10	Site locations for map depot	21c	14
			Standing operating procedures:		
			Typical SOP for an engineer topographic battalion	App. II	76

Typical SOP annex, battalion reorganization for combat	App. III	83	Reorganization of engineer topographic units for combat	31c, 93	20, 51
Storage platoons, engineer base map depot company	138	65	Responsibility for local security	31b, 92	20, 51
Substandard personnel	169	72	SOP engineer topographic battalion, army reorganization for combat	App. III	83
Supply economy	25	18	Teams, engineer topographic:		
Supply officer, battalion	68	41	Geodetic survey team (IJ)	148	68
Supply operations:			Map depot platoon (IE)	146	67
Battalion, army	68	41	Map reproduction platoon (ID)	145	67
Company, corps	45	26	Photographic evaluation team	150	68
Supply, topographic	23, 68	17, 41	Photomapping platoon (IC)	144	67
Survey company, engineer base:			Relief mapmaking team (IF)	147	67
Aviation section	125	62	Survey team (IA)	143	67
Armament	126	62	Terrain team (IK)	149	68
Assignment	118	60	Terrain models and relief maps ..	7d	5
Capabilities	120	60	Tests, training	165	71
Communications	123	62	Topographic supply	23, 68	17, 41
Company headquarters	122-123	61	Topographic operations (see Operations)		
Employment	121	61	Topographic units (see specific unit)		
Equipment	121	61	Topographic services	5	1
Mission	117	60	(see also Capabilities)		
Mobility	119	60	Topographic teams (see Teams)		
Operations section	121	61	Topographic support	10	9
Organization (fig. 23)	117	60	Topographic staffs	10, 65	9, 38
Survey platoons	124	62	Training:		
Tactical operations	126	62	Advanced individual training	163	71
Survey phase of the mapping program	13	9	Advanced unit training	165	71
Survey platoon, engineer base survey company	124	62	Army training program (ATP)	160	70
Survey platoon, engineer topographic company, corps	49	32	Basic combat training	162	71
Survey platoon, H&HDQRS company, engineer topographic battalion, army	73	43	Cadre training	161	70
Survey team (IA)	143	67	Combined training	158	70
Surveys and ground control	7a	3	Filler replacements	168	72
Tactical operations:			Instructor training	170	73
Defense against aerial bombing and strafing	95	53	Objectives	155	70
Defense against atomic or radiological attack	97	53	Phases of training	157	70
Defense against chemical attack	96	53	Postcycle training	166	72
Defense against ground attack ..			Retraining	167	72
Defense plan	94	52	Schools	159	70
Engineer base topographic battalion	31c	20	Substandard personnel	169	72
Engineer topographic battalion, army	99-102	55	Unit training, advanced	165	71
Engineer topographic company, corps	56-63	35	Unit training, basic	164	71
Evacuation	40-43	25	Water supply	26	18
	98	53	Weapons (see Armament)		
			Weather (see Climate)		
			Withdrawal (see Evacuation)		
			Working shifts	20	13

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSPER (1)
ACSI (10)
DCSLOG (2)
DCSOPS (2)
Ofc Res Comp (2)
CRD (1)
COA (1)
CINFO (1)
TIG (1)
TJAG (1)
TPMG (1)
OPO (2)
TSG (1)
CofEngrs (10)
CofCh (1)
USCONARC (5)
USAMC (2)
USACDC (2)
ARADCOM (2)
ARADCOM Rgn (2)
OS Maj Comd (10)
OS Base Comd (5)
LOGCOMD (2)
Armies (5)
Corps (3)
USA Corps (1)
Div (1)
Div Arty (1)
Engr Bde (2)
Engr Gp (2)
Engr Bn (1) except

TOE: 5-55, 5-56 (9)
Engr Co (1) except TOE:
5-167, 5-327, 5-343,
5-346 (3)
USACAG (5)
USACSSG (2)
USASDEG (1)
USACDEC (1)
Div Engr (1)
USMA (10)
Br Svc Sch (2) except USAES (500)
USAQMS (50), USAAMS (16)
USATSCH (10), MFSS (12)
USACGSC (50)
MDW (1)
Instl (2)
USA CD Agey (2) except
USAARTYCDA (5)
USAECDA (10)
USAMSCDA (3)
USATCDA (5)
USACECDA (5)
USAICDA (5)
Units org under fol TOE:
5-57 (3)
5-59 (3)
5-344 (3)
5-347 (3)
5-348 (3)
5-349 (3)

NG: None.

USAR: Same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, AR 320-50.